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THE NATIONAL TELEPHONE MAGAZINE

TELEPHONE ENGINEER AND Management

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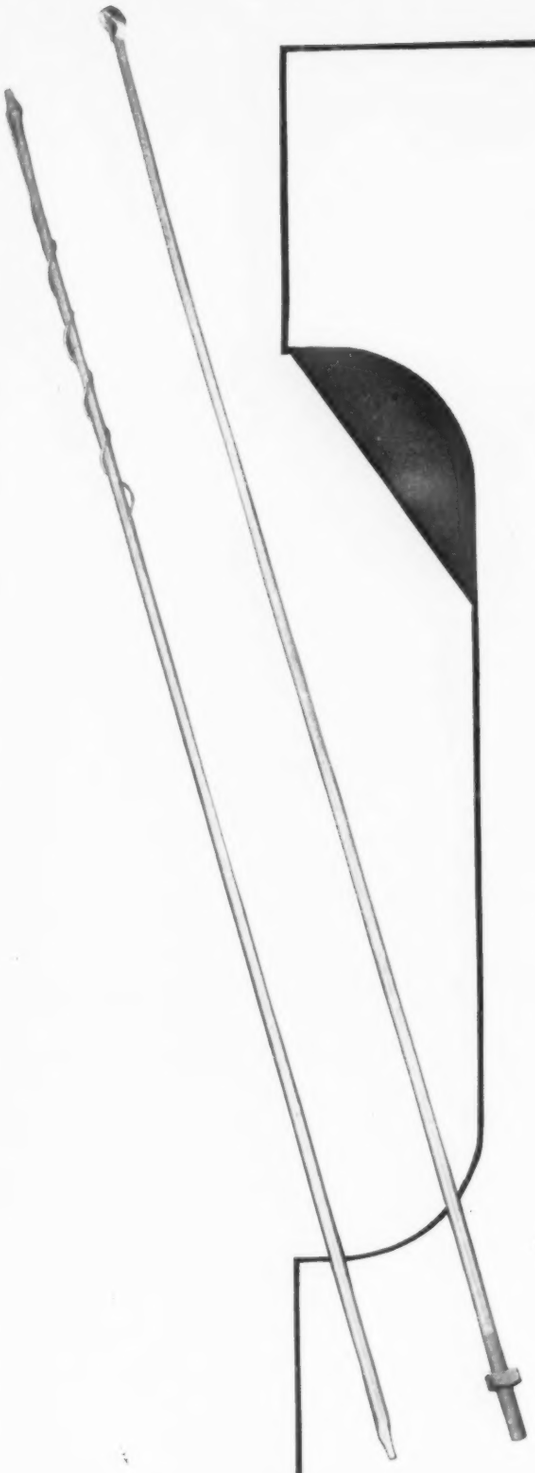
MARCH 1944

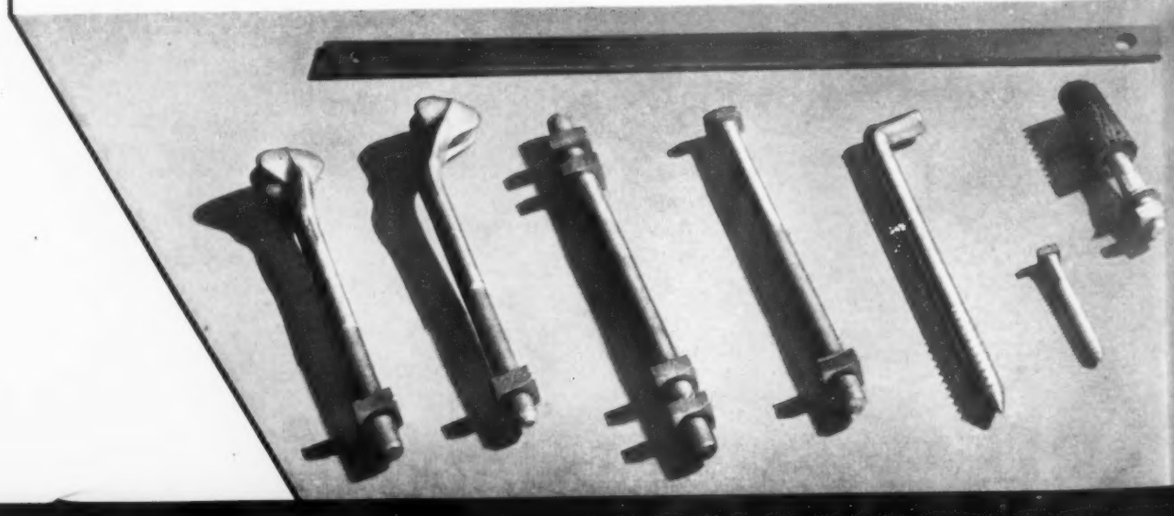


Joslyn

POLE LINE HARDWARE

TYPIFIES THE *Quality* OF LEICH'S COMPLETE LINE OF MATERIALS

Through performance—and performance only—Joslyn Hardware has earned its enviable reputation for quality. For nearly forty years it has done a superlative job for telephone men. Today, it ranks with Klein tools, Amertel conductor, Acorn Wire and other telephone products of unquestioned integrity. As with all quality telephone products, it is available with Leich Service.



LEICH SERVICE

LEICH

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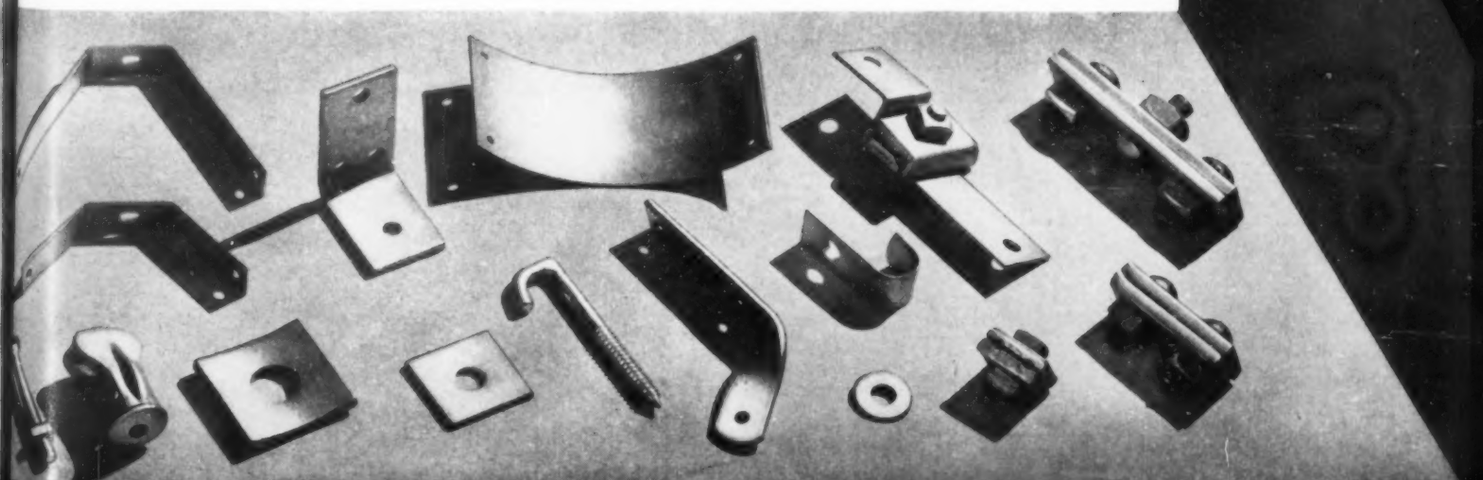


TELEPHONE CABLE

Plan for the future

NOW!

Be Among the First to Reserve Your Place On Kellogg's Future Delivery Schedule—

"Planning for the future" is nothing new to telephone men. It has always been a basic part of good Independent telephone management. Telephone men have always made it a habit to plan for new switchboards, new apparatus, long before existing units were ready for retirement.

If ever there was need to emphasize such "planning for the future," that time is now. Kellogg, through its "future delivery plan" makes it simple, easy and practical. By means of this plan, you can ***immediately*** reserve a place on Kellogg's delivery schedule, when the lifting of government restrictions makes it possible to resume production for commercial use. Here's all you do:

THREE SIMPLE STEPS

1. Get together with your Kellogg representative. Discuss your needs for the equipment (switchboards, telephones, power, line supplies, cable, poles, wire and strand, etc.) you expect to install when production of these items for commercial use is again permitted.

2. List the items you will need on the special "future delivery order" blanks, now available from Kellogg. Get your order in to Kellogg at the earliest possible date.

3. Shortly after you send in your order, you will receive an official Sequence Certificate. This certificate will list the sequence numbers assigned to your order—signifying that a place for the items you require will be reserved on Kellogg's future production schedule.

The rest is up to Kellogg. For as soon as war conditions permit the manufacture of your items, you will be immediately notified. Then you will be able to determine the exact specifications and quantities, modifying the original requirements if necessary, and arrive at mutually satisfactory prices, terms and conditions.

ACT AT ONCE

To be sure of earliest possible delivery, get your future delivery order in now. By doing so, you will assure your company of deliveries while others are experiencing the inevitable delays of last minute ordering. And remember—you'll receive the benefit of every design improvement and engineering advancement then available. Act now—talk with your Kellogg representative—or write for copies of the special Future Delivery Order Blank.

KELLOGG SWITCHBOARD & SUPPLY COMPANY
6650 SO. CICERO AVENUE • CHICAGO 38, ILLINOIS

KELLOGG SWITCHBOARD & SUPPLY COMPANY, CHICAGO, ILLINOIS
SEQUENCE
Certificate
Issued to
Certifying that the Kellogg Switchboard and Supply Company has assigned the following sequence number or numbers for future delivery of equipment as shown in Future Delivery Order No.
dated

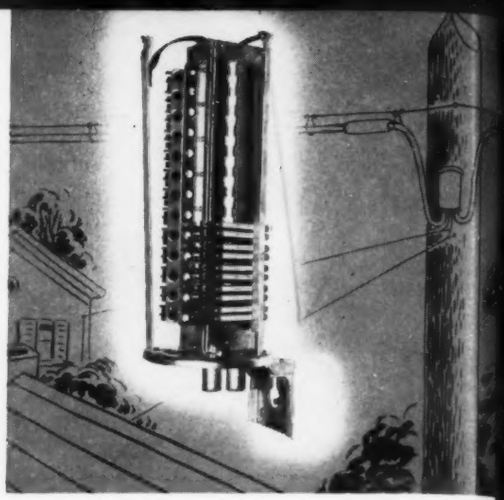
KELLOGG *Finer Communication Equipment*
WHERE ENGINEERING AND RESEARCH BUILD
FOR WAR AND PEACE

Illustrations from Leading Supply Manufacturers Whose Products are Distributed and

Recommended by

KELLOGG

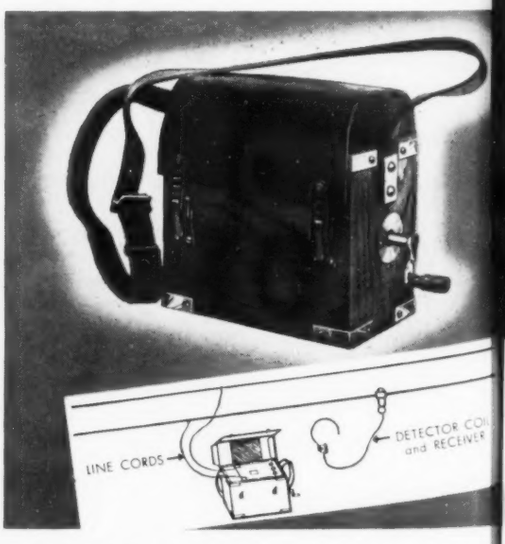
SWITCHBOARD & SUPPLY CO. ★ CHICAGO



Nothing To It. Trouble shooting and transmission testing are greatly simplified when long cable runs are sectionalized with the COOK ELECTRIC CO. UA-20 Cable Terminal. To open cable pairs, you simply remove fuses, and test in either direction.

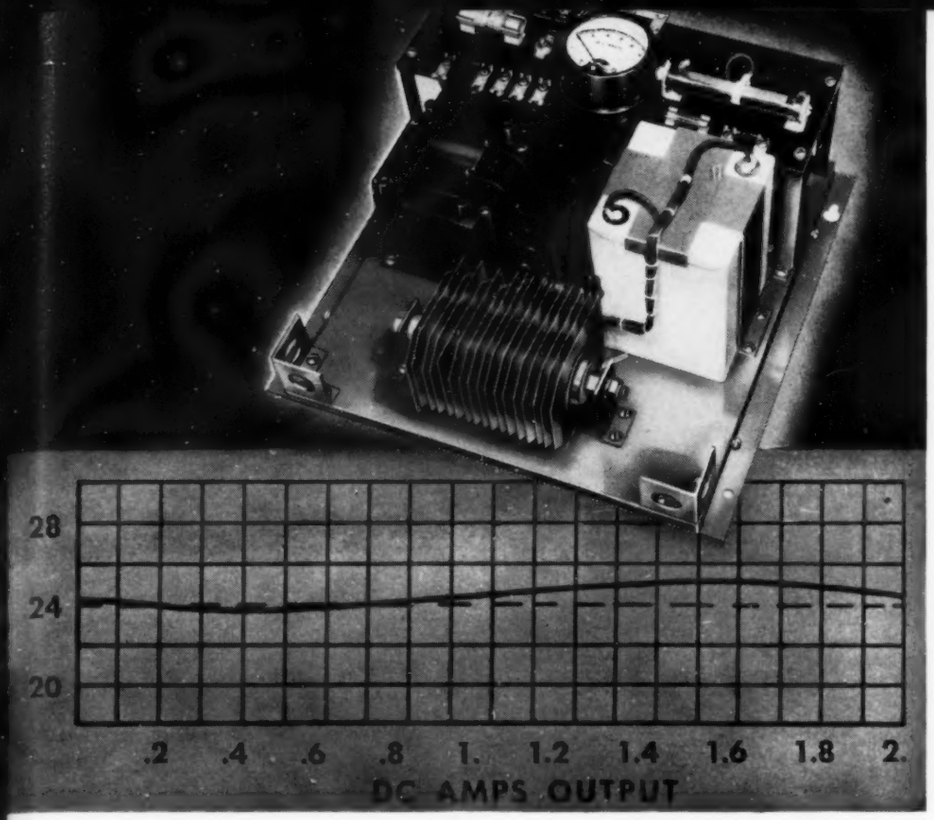
Plenty of Power—enough to sever 1¼ inch branches—is provided by the BARTLETT MFG. CO. Pulley Type Tree Trimmer with its compound lever and double leverage due to the pulley. Available in single length poles, or with pole in various sections.

Favorite Place to Phone for many folks are Churchill Folding Door Booths. And no wonder. These modern booths provide both privacy and comfort—and are designed throughout to please. The No. 100 Booth in the CHURCHILL CABINET COMPANY'S line comes with automatic door switch for lights and electric ventilator . . . new silent electric lighting equipment . . . correct acoustical design . . . new features for more rigidity and longer life.

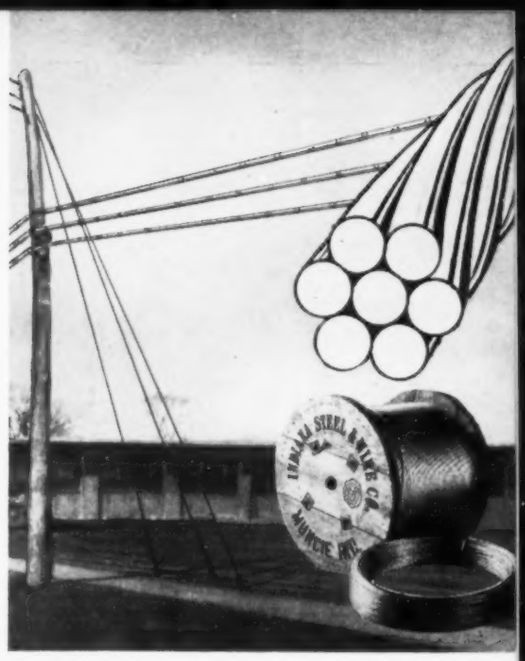


Tells Which Way and How Far trouble is away from the tester without opening the line or cutting a wire! That's why many telephone companies use this STEWART BROTHERS, INC. Heavy Duty Test Set. Use it for fast, accurate, convenient testing.

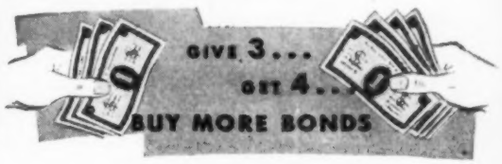
★ FOR PROMPT SERVICE, DEPENDABLE QUALITY



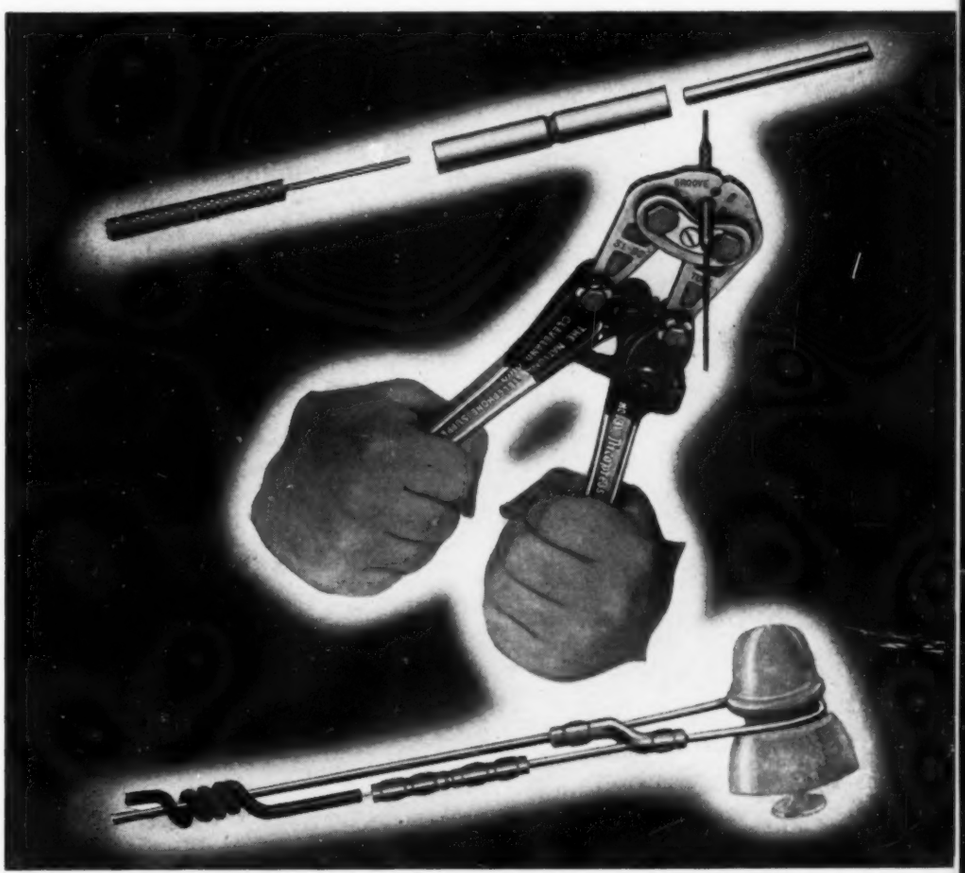
Steady DC Voltage, regardless of AC variations, is essential for proper operation of dial-type telephones and long life for switchboard lamps. The chart above shows a typical curve of DC output voltage under varying loads, proving that Raytheon RectiFilteR provides a stabilized output voltage. Made by the RAYTHEON MANUFACTURING CO., RectiFilteRs require no maintenance, because they have no moving parts . . . nothing to wear out.



Play Safe! Use strong, durable Indiana Crapo Steel Strand. INDIANA STEEL & WIRE CO. protects this rugged strand from corrosion with a heavy, ductile, tightly-bonded zinc coating, applied by the famous Crapo Process.



Meet Every Service Need. That's why so many telephone men settle on Armstrong Whitall Tatum Insulators, made by the ARMSTRONG CORK CO. Crystal clarity and unusual resistance to temperature changes are other reasons for their popularity.



For a Simple Way of splicing two wires of different size, use Nicopress Reducing Sleeves, part of the famous Nicopress Compression Method of splicing, a NATIONAL TELEPHONE SUPPLY CO. development. Such splices are tight and strong, exceed the breaking strength of the conductors, and have a lasting high conductivity. They are easily made on poles or on the ground with the light, easy-to-operate Nicopress tool shown above. Available in various sizes.

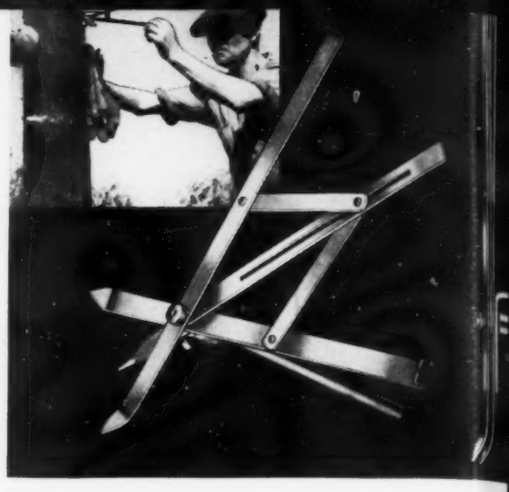
LINE UP WITH Kellogg FOR LINE SUPPLIES ★

Illustrations from Leading Supply Manufacturers Whose Products are Distributed and

Recommended by

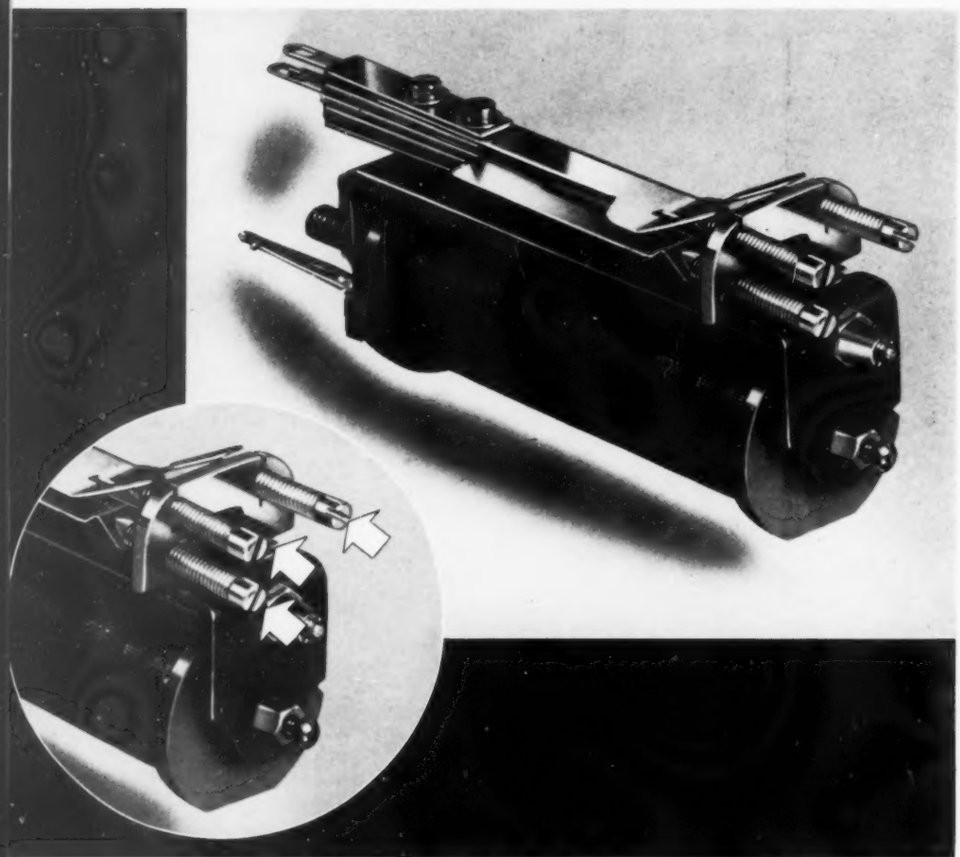
KELLOGG

SWITCHBOARD & SUPPLY CO. ★ CHICAGO

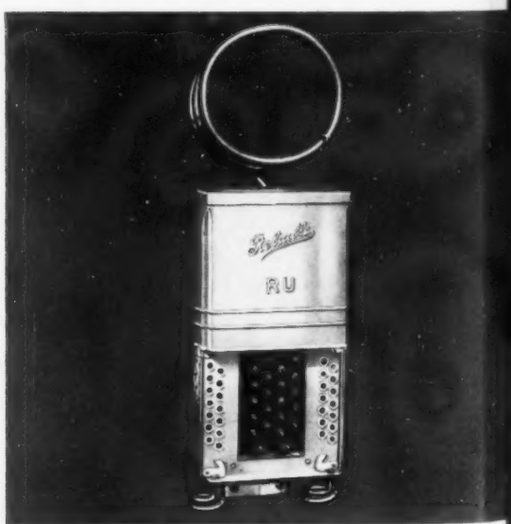


It's a Matter of Seconds to locate the one correct position for pole anchors with the W. C. DILLON & CO. Bisector. This instrument is easy to use—no experience needed. Use it to reduce guyed pole failures due to incorrect guy placement.

A "Must" item in every service man's kit of tools is a VULCAN ELECTRIC CO. Electric Soldering Iron. These irons come in 14 standard sizes of screw tip and plug tip types. Hand forged, pure copper tips . . . high powered heating element.

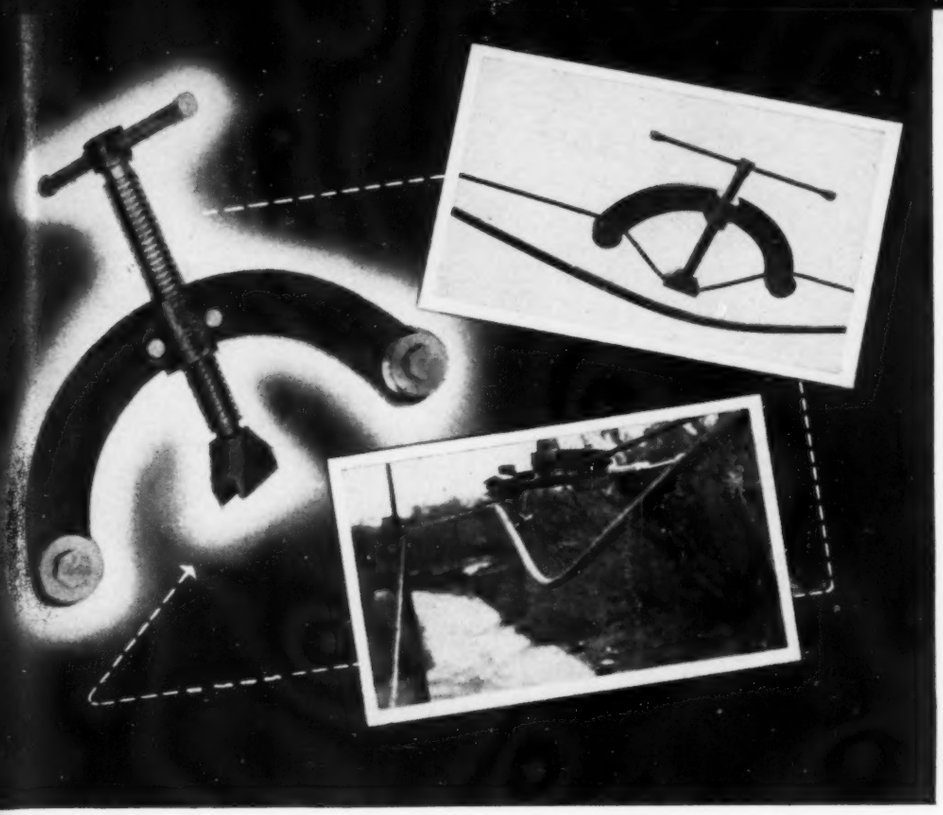


Another Problem Solved! Every telephone man knows that smooth operation of pilot relays is essential to successful switchboard operation. But keeping these relays in correct adjustment has often been a major maintenance problem. Now, with the new KELLOGG SWITCHBOARD & SUPPLY CO. Micrometer Adjustment Pilot Relay, positive and precise adjustment is secured by simply changing the position of three screws (see arrows).



Wide Acceptance throughout the telephone field has been earned by the Type "RU" Cable Terminal. This reversible unprotected terminal, made by RELIABLE ELECTRIC CO., is unusually weatherproof and gives linemen plenty of working space.

FOR PROMPT SERVICE, DEPENDABLE QUALITY



Time and Labor Saver. The "Little Giant" Slack Puller can't be beat for taking up and holding slack in spun messenger stand and cable preparatory to making cable repairs. One man can pull the same slack in 45 seconds as 2 or 3 men in 15 minutes with old methods. Another advantage, according to THE CABLE SPINNING EQUIPMENT CO., is that this slack puller eliminates ruining of insulation caused by working on tight cables. Better get one soon!

Glass Outlasts Wood! In spite of winter cold snaps, spring thaws and summer heat waves, Hemingray Insulators regularly outlast poles. Controlled production by OWENS-ILLINOIS GLASS CO. assures uniformity and high strength.

The Ideal Drop Wire for any weather is Ironite. It's "armored" to provide extra protection against sleet and ice, hot winds, moisture, etc. . . . has great strength and high conductivity. For real economy use PARAGON ELECTRIC'S Ironite.

No Dangling, No Tangling of telephone cords when Kellogg Koiled Kords are used. Subscribers prefer them, because of the neat way they retract into a 9-inch spiral (from an extended length of about 60 inches). You will like them because they help reduce telephone breakage caused by the long conventional cords becoming tangled with other objects or catching under desk or table corners. An exclusive Kellogg product—available for prompt shipment.

FREEDOM ISN'T FREE—
It's Priceless!
BUY WAR BONDS

TY LINE UP WITH *Kellogg* FOR LINE SUPPLIES ★

May we call your attention to the Invitation on page 36 of this issue. The National Association has many serious problems of the industry that are to be discussed and acted upon at the Executives Conference to be held at the Edgewater Hotel, Chicago, April 20 and 21. We understand the Conference will be closed to those not directly in the industry. Read the Invitation of Mr. Bailey to find who is eligible to attend.

▼

Page 28 will show you a tax schedule to use on taxes to be charged under the new tax law that was passed over the Presidential veto. This schedule was prepared for you by the USITA Tax Committee and should be kept for ready reference. If you need additional copies write the USITA at their office in the Munsey Bldg., Washington, D. C.

▼

Those of you wanting the last minute news on Hotel Surcharges should read the Highlights column of Roland C. Davies. Rural telephone people will be interested in the article on page 32—it tells you how and why!

▼

Please order now if you wish additional copies of the Spring Maintenance Number to be issued next month. Paper rationing makes this necessary.

RWS.

TELEPHONE ENGINEER & MANAGEMENT

Vol. 48, No. 3 **MARCH, 1944**

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Founded in 1909

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The newest authoritative handbook on Steel Strand, a gold mine of up-to-date information —for engineers, construction and maintenance men.

AMERSTRAND STEEL STRAND is employed for many purposes. In this handbook, the discussion of its application has been confined mainly to its uses in overhead transmission, distribution and communication lines (1) as guy wire, (2) as messenger wire, and (3) as overhead ground or "static" wire. The book also includes complete data and descriptive material covering the various constructions and grades of Amerstrand Steel Strand—is invaluable as a guide to efficient and economical buying.

Typical Chapter Headings:

Physical Properties — Corrosion Protection — Unreeling and Uncoiling—Guying—Messengers—Overhead Ground Wires — Anchors — Loading Map and Table — Sag and Tension Curves — Standard Lengths —Useful Tables—and other informative data which you will find helpful.

This 98 page encyclopedia, indexed for ready reference, is free. Just fill in and mail the convenient coupon.

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Cleveland, Chicago and New York

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United States Steel Export Company, New York

These tags are placed for your protection on every coil of AMERTEL Telephone and Telegraph Wire and AMERSTRAND Steel Strand. They are your assurance of highest quality.

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Please send me your Amerstrand Handbook.

Name..... Title.....

Company.....

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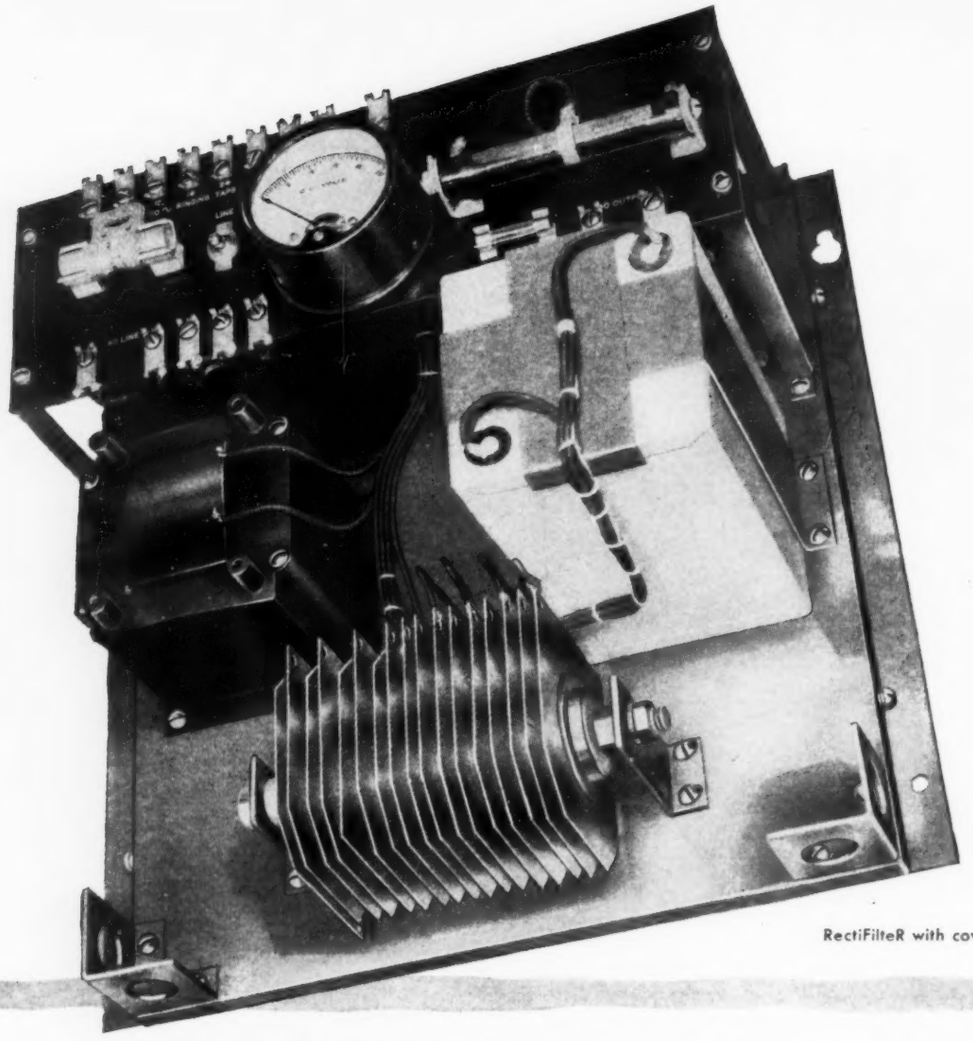
City..... State.....



RectiFilteR with cover removed.

RAYTHEON RECTIFILTERS

(Battery Eliminators)

Here's what RectiFilteRs will do for you—

- ★ Eliminate batteries and the expense of routine service.
- ★ Provide stabilized D.C. output voltage from no load to full load regardless of A.C. variations.
- ★ Minimize power costs because of high efficiency in converting A.C. to D.C.
- ★ Save $30 to $90 a year.

RectiFilteRs have no moving parts . . . require no maintenance.

RELEASE CHARGING CABLE PAIRS FOR REVENUE PRODUCING SERVICE

Raytheon RectiFilteRs help you solve the problem of telephone cable shortages for PBX use. By converting A.C. current to stabilized D.C., RectiFilteRs eliminate storage batteries. This in turn releases cable pairs, required for carrying charging current to PBX boards, for additional revenue producing service. RectiFilteRs are efficient, compact and require no maintenance. Write for bulletin.

The coveted Army-Navy "E", for Excellence in the manufacture of war equipment and tubes flies over all four Raytheon plants where 12,000 men and women are producing for VICTORY.

RAYTHEON MANUFACTURING Company

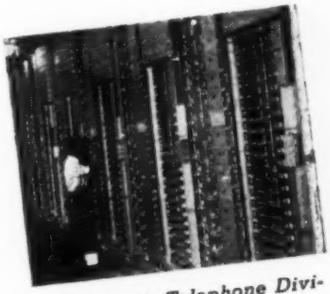
190 WILLOW ST. WALTHAM, MASS.

Federal's Field Telephone

carries the Voice of Victory in every battle sector

The importance of the Telephone Field Set in coordinating the action of the armed forces makes it outstanding among vital military equipment. In less than two years, Federal has become the major manufacturer of this small, compact instrument of communication, the EE-8-B, used by the United States Army Signal Corps and other armed services wherever new fronts are smashing forward.

Responsible for this accomplishment is the broad peacetime background of Federal's engineering experience in communications. This experience, long identified with pioneering telephone developments the world over, is not only concerned with new methods and new equipment in the cause of victory, but in their application to communications needs now and when peace comes.



★ *Federal's Telephone Division also manufactures, for export and other uses, automatic central office telephone equipment, automatic private and private branch exchange switchboards, telephones and a complete range of telephone equipment.*

Federal Telephone and Radio Corporation

TELEPHONE DIVISION

AN IT&T ASSOCIATE

Newark, N. J.

PHOTO BY
U.S. ARMY SIGNAL CORPS

The Army-Navy "E" Pennant, with three stars for continued achievement in production flies over the plant of Automatic Electric Company.

This, too, is "Telephone Business"

When Signal Corps technicians brave front line fire and hidden snipers to string communication wires—they're in the "telephone business," too! Only they work under infinitely more dangerous and deadly conditions than we do here at home—and for the outstanding job they're doing they deserve the highest honors a grateful nation can bestow.

Yet in this all-out war, ***every*** person in the telephone business is doing a vitally important job, as well. Both the manufacturer, producing needed front-line equipment—and the operating man, maintaining important wire channels at top efficiency—are contributing essential services to the country's vast war effort. Without the continued, unremitting application of ***every one of us*** to our own particular job, the tremendous drive and push necessary for victory will slacken, and our whole war program will bog down.

So let's "keep at it!" We want to help every telephone man to continue the splendid work he's doing, and to this end offer the services of our technical consultants in matters of maintenance, engineering, transmission, construction and other wartime problems. No matter what type or size of exchange you operate, call on us for help or advice at your convenience. We're ready and anxious to be of assistance in any way we can.

AUTOMATIC ELECTRIC

ORIGINATORS AND DEVELOPERS OF STROWGER STEP-BY-STEP MACHINE SWITCHING AUTOMATIC DIAL SYSTEMS

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

Distributors in U. S. and Possessions:
AUTOMATIC ELECTRIC SALES CORPORATION, Chicago 7, U. S. A.
Export Distributors: INTERNATIONAL AUTOMATIC ELECTRIC CORPORATION

It Calculates the Time Taken for Toll Calls

Eliminates Errors—Saves Time—Cuts Costs

It costs money and causes unnecessary disputes to be incorrect with the time consumed for toll calls. Why not eliminate these troubles with a Calculagraph?

It is uncanny to watch a Calculagraph print on a card the time a call is started and then automatically figure the time taken for the call, simply by pulling a lever.

You can bank on the accuracy of the elapsed time shown on the printed card because the Calculagraph can't make mistakes in figuring.

It is poor economy to pay operators to do work that a mechanical devise will do cheaper and more accurately without cost.

Write for particulars.

Calculagraph Company
308 Sussex St. Harrison, N. J.

CALCULAGRAPH
Accurate Toll Timing to the Second!

Mr Manufacturer

The SPRING MAINTENANCE & CONSTRUCTION Number of TELEPHONE ENGINEER & MANAGEMENT will be published April 15

You can help make the issue extremely valuable to every telephone company . . . and profitably so . . by advertising the items you have available for immediate delivery

RESERVE SPACE TODAY—LET COPY FOLLOW BY APRIL 1

TELEPHONE ENGINEER & MANAGEMENT

Phone Rogers Park 3040—Wire or Write—7720 Sheridan Road, Chicago 26, Ill.

PIPE LINE TO VICTORY

Up ahead the cluster of houses where the enemy had holed in crumbled. You could see the rubble flying high in the air and before the dust had settled could see other shells hit the mark.

Hunkered down in a shell hole, the observer pressed his lips closer to his phone's mouthpiece. "On target," he said . . . and his words went back across the rough terrain to the battery . . . came through clearly, distinctly.

That's because Laytex Assault Wire . . . made expressly for front line service . . . has a talking distance of better than five miles. It is a positive means of assuring clear, sure transmission of messages from reconnaissance posts to headquarters.

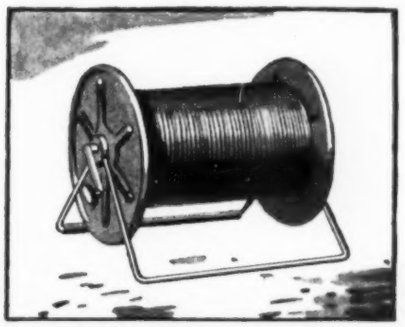
But talking distance is not the only advantage of Laytex Assault Wire. Its superior insulation makes possible its small diameter and light weight; a mile weighs less than 30 pounds. It has high resistance to moisture—can be unreeled over wet ground, through puddles and streams without affecting its efficiency. It is unaffected by temperature changes and does not become embrittled by concussion and shock

These same properties—light weight, small diameter, ability to withstand temperature changes, flexibility and toughness make other types of Laytex Wires and Cables as important in peacetime industry and building as to the Armed Forces.

ASSAULT WIRE

ON THE JOB IN ANY CLIMATE. Laytex Assault Wire was developed by United States Rubber Company scientists working in close cooperation with engineers of the Army Signal Corps.

LIGHT WEIGHT SAVES MANPOWER. One man carries enough wire to keep communications open. This is important—it not only releases men for other duties but also reduces the fatigue of men who are travelling hard and fast.



TALKING DISTANCE...OVER 5 MILES . . . Laytex Assault Wire assures clear, sure transmission of messages—a prime military requirement for battlefront communications.

Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

SERVING THROUGH SCIENCE TO BUILD A BETTER WORLD

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"—AND I LEFT THE FARM FOR THE PHONE COMPANY TO GET AWAY FROM PLOWING!"

MODERN TOOLS for TELEPHONE WORK COME FIRST...*via* GRAYBAR

Whether it's a wire-laying plow or a tree pruner, a ladder or pliers, you'll find that GRAYBAR is your most efficient source of supply. Without prompting, we know the wartime procurement procedures that clear the way for delivery of essential items.

If stocks are available *anywhere,* the GRAYBAR warehouse is your best bet! If delivery must be expedited from the factory, you can count on us for complete "follow-through".

GRAYBAR selects its tool lines—and all its other telephone supplies—on the basis of the specialized requirements of telephone work. Right now, many GRAYBAR customers are getting the benefit of the long-lasting construction built into tools they bought before the war.

For your war-essential needs today—for *all* your tool requirements tomorrow—your local GRAYBAR Representative is the man to call.

3503

GraybaR

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Executive Offices: GRAYBAR BUILDING, NEW YORK 17, N. Y.

LETTERS

from TELEPHONE ENGINEER readers

Dear Friend Ray:

Just received yours of recent date, having been away on a trip and just returned. I, indeed, was happy to hear from you.

I have been down to New Caledonia for some special training. It was an interesting trip, which I made via air both ways, and quite a treat to be able to get back into a little civilization for a change. I took advantage of every moment while there, believe me!

It is quite a colonial place, although not as large as Fiji. There were many interesting things to see, and I found the weather considerably warmer than it is here, because the sun is almost directly overhead there now.

Fourth Class mail must have gone on a strike. I have not received any magazines—Time, Telephone Engineer, etc.—since about the first part of November. Am still looking forward to receiving the Convention issue, too, and still have hopes they all will turn up one of these days.

This is my headquarters. 1st Lieut. A. J. Isaacs, Jr. is at the right.

I hope by the time this reaches you that you will have received my small package, and that it arrived in good order and not too badly tarnished.

I believe you are correct in having to get a censorship O.K. before you can use

(Please turn to page 58)

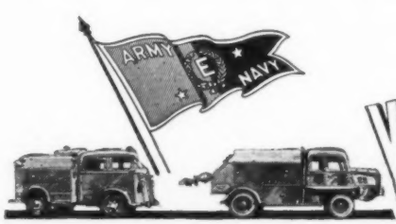
Inside of headquarters.

ALL ALONG THE LINE...

This is York-Hoover Model 4013-WL, a practical combination body unit incorporating capstan or horizontal winch, overhead ladder and ring assembly, ample space for tools and materials in side cabinets, telescoping roof, diamondette steel floor and sturdy understructure.

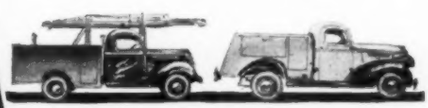
Yes, all along the line you will see these YORK-HOOVER Bodies turning in one efficient day's work after another. Their performance during these war emergencies has proven their ability "to take it." York-Hoover Public Utility Equipment Engineers designed and built these bodies. Their performance and ability "to take it" have proven that skillful engineering, the right materials and long years of experience are still the best insurance for constant, trouble-free operation.

York-Hoover engineers are planning even better construction of new equipment, light and medium duty units, as well as heavy duty line bodies; so let us help you with your future plans by producing better body equipment for you—*for tomorrow*.



YORK-HOOVER CORPORATION

BODY DIVISION **YORK, PENNSYLVANIA**

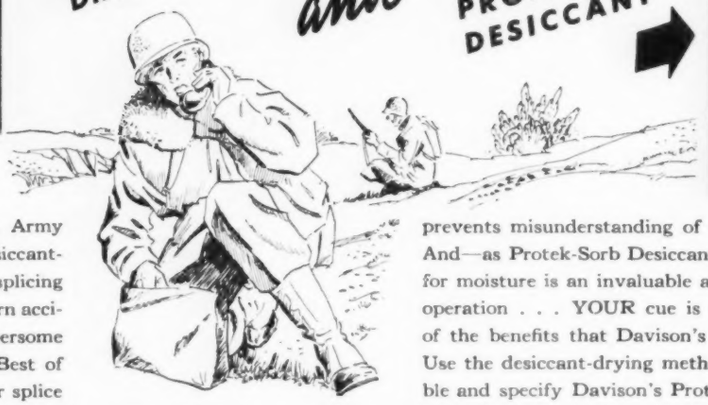


TEAMMATES ON THE FIRING LINE

THE DESICCANT DRYING METHOD

and

DAVISON'S PROTEK-SORB DESICCANT



AT THE BATTLE FRONT—

Often under fire—the U. S. Army Signal Corps employs the desiccant-drying method. The cable-splicing operation is speeded up . . . burn accidents are eliminated . . . cumbersome equipment is not necessary. Best of all, this method assures a drier splice . . . restoring quickly the perfect voice transmission that prevents misunderstanding of vital battle orders. And—as Protek-Sorb Desiccant's greater capacity for moisture is an invaluable aid in this do-or-die operation . . . YOUR cue is to take advantage of the benefits that Davison's Protek-Sorb offers. Use the desiccant-drying method wherever possible and specify Davison's Protek-Sorb Desiccant. It pays dividends in time-savings, efficiency and safety.

See your supplier for illustrated instruction sheets.

THE DAVISON CHEMICAL CORPORATION

Progress through Chemistry

BALTIMORE-3, MD.

Canadian exclusive sales agents for DAVCO SILICA GEL: CANADIAN INDUSTRIES LIMITED—GENERAL CHEMICALS DIVISION

You Get ALL THESE EXTRAS

Tremendous Strength
Exceptional Uniformity
Smooth, True Surfaces
Thorough Impregnation
Clean, Dry Finish

EXTRA LIFE!

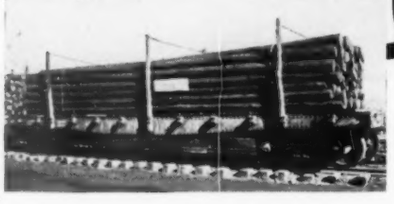
in Taylor-Colquitt Poles

You get a lot of "extras" when you use Taylor-Colquitt Poles of Southern Pine.

Sound, straight trees, from some of the finest stands in the South, provide poles with tremendous strength, and the uniformity that makes good-looking pole lines. Each pole is machine-trimmed, on special Taylor-Colquitt machines—turned out round and smooth and true. And then, after proper seasoning, it is treated with creosote—thoroughly impregnated to a depth of 2½ inches (or 85% of the sapwood)! A final treatment with live steam produces a clean, dry finish, makes poles easy to handle in any weather.

These Taylor-Colquitt "extras" at every point ***pay off*** in EXTRA YEARS of trouble-free service. That's why we sell, and recommend, Taylor-Colquitt poles.

TAYLOR-COLQUITT CO. T-C TIMBER CONSERVATION



AUTOMATIC ELECTRIC SALES CORPORATION

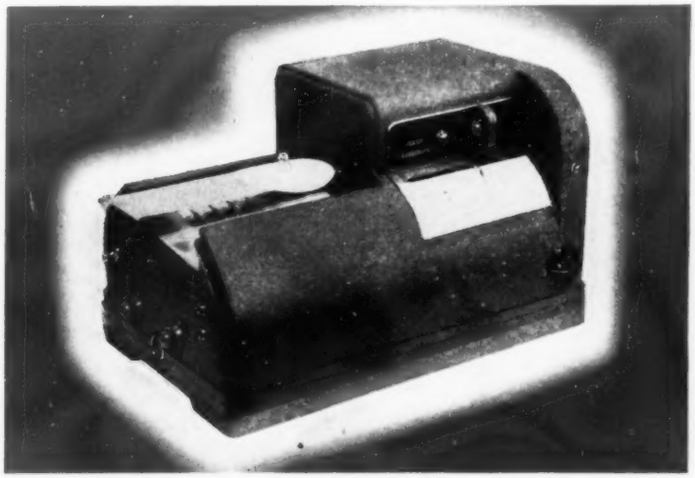
1033 WEST VAN BUREN STREET, CHICAGO 7, ILLINOIS

Business is Words...
Thousands of Words...
Millions of Words!...

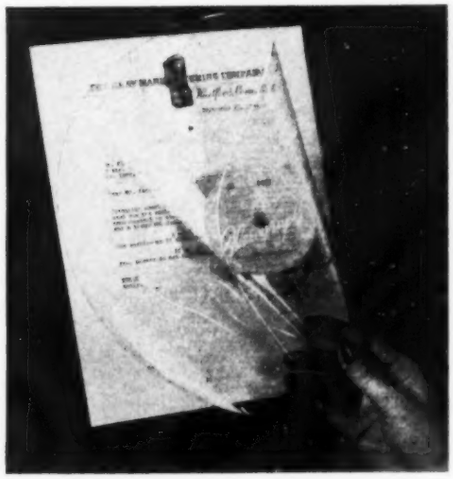
It makes so much sense to get those spoken words in a permanent record the minute they are said . . . a record that can be immediately played back at the turn of a knob, that can be *filed readily in much less space than a typewritten report,* and that costs far less to produce.

Today the Audograph is being used by our government for recording our own and enemy broadcasts, for airways traffic control, for code reception (at both normal and very high speeds), for reconnaissance and observation recording, for interviews and interrogations in counter-espionage, and for permanent, space-saving records of verbal orders.

The Audograph records on paper-thin, plastic, Flexograph discs made in three sizes: 7-⅜", 9-¼" and 12" in diameter, providing recording time of 16 minutes, 31 minutes and 61 minutes *on each side.* The large size thus gives a permanent record of over 14,000 words. Typewritten that would be 28 single-spaced pages, and the cost, by Audograph, is less than ten cents. Ask your office manager how that compares with typing costs, or with any dictating machine.



● Developed after many years of research into the practical as well as the scientific problems of day-to-day business recording, playback and filing, the Audograph has every convenience and economy.



● As a letter preserves the written word, so a Flexograph record inexpensively preserves the spoken word.

√Have you an idea or invention in electro-mechanics?

. . . which you think will aid the war effort, or has a peacetime application? We'll be glad to develop it with you on a mutually satisfactory basis. . . We plan to add five or six products for postwar. If you have an idea or product which you believe will round out our activities, write Mr. W. E. Ditmars, President, in detail. We will consider any practical arrangement.

THE GRAY MANUFACTURING COMPANY

MAKERS OF TELEPHONE PAY STATIONS SINCE 1891

HARTFORD, CONNECTICUT · 230 PARK AVENUE, NEW YORK

These Companies will receive

SELECTIVE SERVICE FOR OUR DOLLARS

The armed services have first call on our country's man power—they should have first call on our dollars, too. Let's all stop spending for non-essentials and put our dollars into the fight by buying that *extra* War Bond today!

ive Preferred Deliveries . . .

HOW ABOUT YOU?

"Far-seeing telephone companies have been quick to take advantage of Stromberg-Carlson's plan to insure preferred postwar delivery of telephone apparatus," says Ralph H. Barger, Sales Manager, Telephone Division, Stromberg-Carlson Company.

Under this Stromberg-Carlson plan, operating companies can place orders *now* for manufacture and delivery of equipment as soon as Government regulations permit.

A careful record is kept of the dates on which all orders are received. So far as practicable, Stromberg-Carlson will do the necessary engineering work in the order in which these contracts are received and will put them into production in that same sequence.

Your Stromberg-Carlson sales representative has complete details of the workings of this plan and can also explain Stromberg-Carlson's interesting proposition regarding prices and terms. It will be well worth your while to consult him before deciding what telephone equipment you will buy for postwar delivery. Talk to him *soon* and put yourself in line to receive early deliveries of needed telephone apparatus.

STROMBERG-CARLSON COMPANY
Factory, General Offices: Rochester 3, N. Y.
Branch Offices: Chicago, Kansas City, San Francisco, Toronto

. . . New Federal Development Revolutionizes the Metal Rectifier!

By the use of a simple CENTER CONTACT *Federal has achieved another "first" in Selenium Rectifier development.*

The result — remarkable new corrosion resistance and weather stamina added to the important advantages already inherent in Federal Selenium Rectifiers.

Outstanding among these advantages are high efficiency over a wide range of load; small size and light weight; adaptability to wide ranges of temperatures, humidities and atmospheric pressures — plus maintenance-free operation.

CENTER CONTACT *is available only in Federal Selenium Rectifiers, first in the field and standard for industry.*

Federal battery chargers and power supplies, powered by Selenium Rectifiers, have wide application in the fields of radio, telephone, telegraph, aviation, railway signaling and wherever direct current is required from an AC source.

Federal Telephone and Radio Corporation

AN IT&T ASSOCIATE

Newark, N. J.

Highlights of the Communications News

Important Communications developments of the past month, briefed for busy readers

by
ROLAND C. DAVIES
Editor, Telecommunications Reports

Straws in the Wind

WHAT effects and repercussions upon the various facets of the government in Washington which deal with the telephone industry will be produced from the recent Congressional "revolt",—especially in connection with the Federal Communications Commission — remains an important portion of the National Capital picture that has not yet been unfolded with any definite clarity.

The coming Presidential campaign is, of course, going to engender more political heat and fireworks in Washington than has probably characterized any period of the country's history. The Fourth Term campaign of President Roosevelt, if he decides to run, is certain to produce a tremendous amount of bitter speech-making and the fire of charges and countercharges. The recent tax bill veto speech of Senator Barkley, Senate Democratic leader, in flaying Mr. Roosevelt for his criticism of Congress appeared to be the "starting gun" of the sharp divisions of public opinion that will be aroused in the coming national campaign.

FCC Chairman Fly

CAUGHT in the vortex of the campaign controversies is the FCC and especially its Chairman James Lawrence Fly so that the latter is facing the stiffest fight in his career which he has experienced in Washington. In Congress Chairman Fly is engaged in his toughest tussles, but he has also encountered a number of scraps in other government departments, particularly the armed services.

On the amount of the appropriations for his agency in the next fiscal year beginning July 1, 1944, FCC Chairman Fly has waged a losing battle. The Senate Appropriations Committee not only upheld the $1,650,000 slash, voted by the House, but also even reduced the Commission's funds by an additional several hundred thousand dollars. This marked the first time that Congress has cut deep into the FCC's budget during that agency's 10-year existence. The slashing of the FCC funds, particularly the paring down of its war operations—the Radio Intelligence and Foreign Broadcast Intelligence Service—was regarded as a direct rebuff of Chairman Fly who had not only tangled with the Army and Navy in order to keep these two activities intact but also had waged a most concerted effort on their behalf before the House and Senate Appropriations bodies.

The special House Committee investigation of the FCC and Chairman Fly's activities and powers became the most significant springboard of attack on that agency during early March with the Republicans in Congress trying to make the course of the probe a political issue with the aim of carrying into the coming campaign the charge that the Roosevelt Administration is endeavoring to control radio broadcasting. The political fireworks started after House Committee Chief Counsel Eugene L. Garey resigned and accused Committee Chairman Lea of "white-washing" the Commission. Leading Republican representatives took to the floor of the House to bandy about accusations that the story of the FCC was studded with Administration intrigue and scandal in the granting of broadcasting station licenses and that Chairman Fly opposed the Army and Navy in the prosecution of the war through his efforts to retain the FCC's extensive radio monitoring service, the Radio Intelligence Service, after the Joint Chiefs of Staff had recommended to the President that the RID operations should be transferred to the Army.

Fly To Present FCC Side

CHAIRMAN FLY and the Commission, however, during the second week in March were at last given their chance to present the FCC's side to the House Committee. Having accused the former Committee Counsel Garey with grossly unfair tactics and "biased persecution" of the Commission in the previous hearings which have lasted intermittently for almost a year, the FCC leadership firmly defended their war activities of the RID and FBIS. Chairman Fly was felt to have answered many of the charges brought by the former counsel about the FCC war operations and, in particular, the accusations about having contributed to the Pearl Harbor disaster. Mr. Fly also made a potent advocacy for an international communications merger.

Senate Action

ON the Senate side of the Capitol, the White-Wheeler bill which would reorganize the FCC and would revamp its broadcasting regulatory powers still was awaiting consideration by the Senate Interstate Commerce

Mt. Lungo Area, Italy. Pvt. Ernest Sorrento, an Italian and Nesbit M. Moss, Jackson, Ga., of a Signal Service Company, at Italian Command Post. Italians and Americans are working together at Command Post. (See page 34.)

Committee. The most significant portion of this measure for the telephone industry will be the outcome on the reorganization divisions of the bill. Senate Committee Chairman Wheeler is understood to favor the reducing of the FCC's size from its present seven members to five commissioners. The bill's co-author, Senator White of Maine, the ranking Committee Republican, advocates the splitting of the Commision into two divisions—one to handle communications and the other broadcasting—with the chairman not sitting on either division but being in charge of the executve activities of the agency.

Another proposal has been the institution of the rotation of the chairmanship such as is done in the Interstate Commerce Commission and Federal Trade Commission with the members of those commissions holding the chairmanship successively for a period of a year. The latter proposal has won a good deal of approbation within the Senate Committee and among those following the legislation because it would mean that no single member of the FCC could assume dominant power over the agency to the exclusion of the other commissioners.

International Merger Study

THE inquiry into the postwar international communications needs of the United States and the proposal for a merger of the American international communications companies by the Senate Interstate Committee has remained during recent weeks at a standstill. After the Committee has completed consideration of the White-Wheeler bill, it plans to take up the international merger study, but the earliest opportunity for its hearings on the international merger appears to be early April.

The international merger subject has been most thoroughly discussed, it is known, by the State Department and other interested governmental agencies with the leading American communications companies, but naturally because it would be a violation of the anti-trust laws the companies have not been able to formulate a pattern for this projected consolidation in advance of legislation permitting it by Congress. The views of the State Department which has had for more than six months an interdepartmental State-Army-Navy-FCC-Civil Aeronautics Administration planning committee working on the problem have also been submitted to the leading members of the Senate Committee. Up to date there is the disposition that this interdepartmental committee would be established in the legislation to carry forward, if an international communications merger is created, as the governmental policy-making body to transmit to that combine the needs of the American government both for national defense and for international trade relations. In this manner the FCC would only be retained as the rate regulatory body and would not have policy-making powers. It is understood that a number of leading Senators are definitely opposed to giving the Commission authority on policies of the projected merger.

Convention Dates

Kentucky Independent Telephone Association, Lafayette Hotel, Lexington, April 5.

Tennessee Independent Telephone Association, Hermitage Hotel, Nashville, April 7.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, April 11 and 12.

Nebraska Telephone Association, Hotel Fontennelle, Omaha, April 13 and 14.

Illinois Telephone Association, Edgewater Beach Hotel, Chicago, April 18 and 19.

Spring Executive Conference, United States Independent Telephone Association, Edgewater Beach Hotel, Chicago, April 20 and 21.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 25 and 26.

Indiana Telephone Association, Serverin Hotel, Indianapolis, May 3 and 4.

Wisconsin State Telephone Association, Park Hotel, Madison, May 10 and 11.

Pennsylvania Independent Telephone Association, Berkshire Hotel, Reading, May 17 and 18.

New York State Telephone Association, Hotel Syracuse, Syracuse, May 24 and 25.

Washington and Oregon Independent Telephone Associations, joint convention, Columbia Gorge Hotel, Hood River, June 23 and 24.

United States Independent Telephone Association, Stevens Hotel, Chicago, October 10, 11 and 12.

Missouri Telephone Association, Place not decided, November 21 and 22.

Manpower, Wages

MANPOWER problems have become one of the worst headaches for telephone companies. With the decision of the Selective Service to rule out industrial deferments extensively, telephone companies, both Bell System and Independents, have found their manpower situation the "toughest nut" to crack in their efforts to maintain service operations. There may be, however, some remedial factors on the horizon which might serve to lighten this problem—the Western European invasion when it is launched and got under way and the cutting down of certain lines of war production with the consequent release of labor. Until the picture is clearly defined, telephone company managements should sit tight and make out the best they can with the hope that such factors as above may alleviate some of their manpower problems.

Despite the efforts of certain leaders to paint the rise in the cost of living beyond the official figures of the Labor Department, the National War Labor Board so far has stood by its guns in maintaining the "Little Steel" wage formula as the gauge for increasing pay levels. Congress, too, has also been willing to strengthen the hand of the WLB in this position. **But it is anticipated that the Independent telephone industry may soon be faced with a governmental decision, that of the Wage-Hour Division, which will sharply increase its wage load.** The Wage-Hour Division is expected to hand down its ruling in early April on the immediate imposition of a 40-cent-per-hour minimum wage for telephone operators and employees, which would be over a year in advance of the statutory time for this minimum wage increase that is due to become effective under the Fair Labor Standards Act in October, 1945.

Hotel Service Charges

THE service charges, assessed by hotels, clubs and apartment houses upon telephone calls of their guest and patrons, have become the most important specific development for the telephone industry as a result of decisions by governmental agencies in Washington. This situation arose after the FCC and the District of Columbia Public Utilities Commission had ruled these "surcharges" of hotels, levied to cover the costs of their telephone service for guests, came within their regulatory jurisdiction. Both Commissions banned the levying of any such surcharges, but in the case of the handling of long distance calls by ho-

tels, etc. the FCC permitted the American Telephone & Telegraph Co. to pay a 15% commission on the tolls collected.

But a storm was immediately created by the hotel organizations. It blew the issue into the courts and back upon the laps of the two regulatory agencies. So the final determination of the regulatory handling of this problem still is a matter that won't be settled for several months.

The developments were highly complicated. A blow-by-blow description of them follows:

1. The American Hotel Association asked the FCC to reopen its order banning long distance service charges in a proceeding to determine whether or not the A. T. & T. and Bell System companies' tariffs which put into effect this prohibition against hotel surcharges on long distance calls Feb. 15 were unjust, unreasonable and discriminatory. So far the Commission has not ruled as to whether it will grant such an inquiry.

2. The FCC lost its first court battle on these hotel surcharges when U. S. District Judge Goldsborough refused a preliminary injunction against the Hotel Association of Washington, D. C., to put into effect the Commision ban against these long distance service charges. The refusal by this court of the preliminary injunction will in all probability stymie the FCC's effort to institute a similar restraining order upon hotels in New York and Chicago. The Federal Judge in Washington in his ruling cited that the practice of these extra charges by hotels were too long-standing and were accepted generally by guests to be upset by a temporary injunction and he also rejected an FCC proposal to have the hotels keep an accounting of the surcharges levied against guests as impractical until the court case if finally decided.

In presenting the argument for the telephone companies, A. T. & T. General Attorney T. Brooke Price emphasized that the telephone companies were "in the middle" in these proceedings and brought out that any restraining order which would direct the cutting off of long distance service from hotels not abandoning the surcharge would be a most harmful move.

3. The Hotel Association of Washington has asked the District of Columbia Commission to reconsider its order rejecting the tariffs of the Chesapeake & Potomac Telephone Co. which would have permitted Washington hotels to levy a uniform 5-cent surcharge on local calls. But the D. C. Commission rejected the reconsideration petition. In its petition for reconsideration the Hotel Association stressed that this 5c surcharge was a prevailing practice in many sections of the country and most major cities. The D. C. Commission had ordered the surcharges on local calls removed effective March 1 by Washington hotels.

4. Both the FCC and D. C. Commission are facing court tests by the Hotel Association of Washington challenging their regulatory jurisdiction over the surcharges. The hotels asserted in their suits that the telephone service to guests was not public utility telephone operations but was actually "secretarial service." They stressed that their switchboards were manned by their own employees, that many of the telephonic services for the guests were those not provided by telephone companies and that much of the telephone service was intercommunicating. The FCC and the D. C. Commission have until the latter part of April to file their answers to the suits with the court.

A QUESTION!

By an Independent Telephone Pioneer

Name four of the largest Islands of the world in order as to size.

(For answer turn to page 76.)

Recognizes Voices Over Telephone by "Color"

Something new in public relations comes from Miami, Fla., where a Chamber of Commerce information specialist identifies voices over the telephone by "color."

She is Mrs. Herbert Tompkins, who has been handling hundreds of calls daily for the past seven years, according to The American Weekly.

Explains Mrs. Tomkins: "Voices are like people. You can usually tell a person's character by his telephone personality. Some voices are dark brown, others dark blue."

She says men's voices generally are dark brown, "deep and smooth." A "dark blue" speech, she adds, has "a lilt to it with lights and shadows."

Mrs. Tompkins assigns all colors of the rainbow to the voices of the people she talks to. She is able to recognize a voice she hasn't heard for months.

U-2 Installation Appeals

As the bottom of the barrel for telephone instruments is being reached, the WPB Communications Division is receiving a greatly increased number of appeals for installations of telephone service under the U-2 Order and is having to apply very strict tests on the applications which it grants.

Where in last August an average of 70 applications on appeals from U-2 were received, the present filing of appeals amounts to 300 a day. This upward trend in the number of appeals, demonstrated the seriousness of the lack of telephone facilities.

Practically all of the current appeals are from non-Schedule A users who are seeking to have treatment of their telephone installation application on the basis of Schedule A. Approximately 95% of the appeals are in that category. Previously the appeals had been largely for extension telephones and additions to exchange line plant.

At the next meeting of the Division's Equipment Manufacturers Advisory Committee on April 6 the major problem will be on the current decrease in war production and, in certain lines of apparatus, terminations of Army contracts. In order to hold intact their present trained personnel, the telephone manufacturers who are facing warcontract cut-offs are desirous of securing sanction to turn to limited production of civilian equipment. However, no policy determination on this issue has yet been formulated.

Cable With Built-In Messenger

The United States Independent Telephone Association in its letter number 52 to member companies carries information regarding telephone cable having a built-in messenger. The bulletin says: "Although rumors are heard in the telephone industry from time to time that experiments are being conducted with telphone cable having a built-in messenger, no cable of this kind has yet been put on the market. It is interesting to note, however, that a manufacturer of power cable is now furnishing a three-conductor cable which is attached at the factory to a supporting strand by means of a spiral wrapping of copper tape. This results in a single unit that can be installed in one operation. It is claimed that movement between cable and messenger is practically impossible and that ring cutting is eliminated.

Here is Your Tax Schedule—

(REVISED)

Tax Committee
United States Independent Telephone Association

REVENUE ACT OF 1943
EXCISE TAXES IMPOSED ON TELEPHONE, TELEGRAPH, RADIO AND CABLE FACILITIES

(1) **Effective April 1, 1944,** amounts paid for each telephone or radio telephone message or conversation **which takes place on or after April 1, 1944,** for which the toll charge is more than 24 cents and amounts paid for each domestic telegraph, cable, radio dispatch or message **sent on or after April 1, 1944,** are subject to a tax of 25%. Thus, during the transition period, principally April and early May, many bills will carry some toll charges and telegrams charged at the **old rates** and some at the **new rate,** depending on whether the service was rendered **prior to April 1,** or **on or after April 1.**

(The rate of tax on international telegraph, cable or radio dispatches or messages continues at 10% and is not increased.)

(2) **Effective May 1, 1944,** amounts paid for leased wire, teletypewriter or talking circuit special services are subject to a tax of 25%, except where such services are used exclusively in rendering wire and equipment service, stock quotation and information services, burglar alarm and fire alarm service and all similar services, in which case the tax is 8%.

(3) **Effective May 1, 1944,** amounts paid for local telephone service and for toll messages for which the charge is 24 cents or less are subject to a tax of 15%.

(4) The increases in taxes effective May 1, 1944, (2 and 3 above) apply only to amounts paid pursuant to **bills rendered on or after May 1,** but the increased rate applies if the services were rendered not more than two months before May 1, 1944, if included on bills rendered on and after May 1. If the bills rendered include charges for service rendered more than two months before May 1, (prior to March 1) the old rates of tax apply to such services.

(5) The present exemption accorded communication services furnished to the United States terminates on June 1, 1944. On and after that date the taxes mentioned in (1) above apply with respect to messages, conversations, and dispatches originating on or after June 1, and with respect to the taxes mentioned in (2) and (3) above the tax is applicable to amounts paid pursuant to bills rendered on or after June 1, for services for which no previous bills were rendered.

(6) The following table summarizes the increase in rates imposed by the 1943 Revenue Act.

Service	Old Rate	New Rate	
Long Distance Telephone (calls over 24c)	20%	25%	(1)
Domestic Telegraph, Cable or Radio Dispatches	15	25	(1)
International Cable or Radio Dispatches	10	10	
Leased Wires, etc.	15	25	(2)
Wire and Equipment Service	5	8	(2)
Local Telephone Service	10	15	(2)
Short Haul Toll (Calls 24c and under)	10	15	(2)

(1) For Services rendered on or after April 1, 1944

(2) For amounts paid pursuant to bills rendered on or after May 1, 1944 (except for service rendered prior to March 1, 1944, in which case the old rate applies).

Telephone Engineer's TRAINING COURSE

☆

ELECTRICAL FUNDAMENTALS FOR THE TELEPHONE MAN

☆

A.C. Testing Instruments---Part X

Reason That D.C. Meters Cannot Be Used on A.C.

LET us next consider the type of measuring instruments that are used on A.C. circuits. Virtually all instruments used on D.C. circuits employ a permanent magnet.

Direct current instruments that employ permanent magnets (this embraces practically all types with the possible exception of the hot wire D.C. meter) cannot be employed for the measurement of alternating current inasmuch as the magnet polarizes the coil so that current must be passed through the coil in a fixed direction; otherwise it will deflect off the scale. If alternating current is connected to one of these instruments, when the current flows in the proper direction on one half cycle, the needle would tend to deflect properly and on the next half-cycle would tend to deflect off scale. If the frequency of the alternating current is relatively high, that is, above 5 or 10 cycles per second, as for example, 60 cycles, the needle and coil would give no deflections as they would be unable to keep up with the rapid alternation, hence would not deflect in either direction, but would merely vibrate. It should be pointed out that it is hard on a direct current meter to connect it to an alternating current source as it tends to demagnetize the permanent magnet.

From what has just been said it is apparent that a different type of instrument is required for A.C. measurements than for D.C.

The principle types of A.C. measuring instruments are the **soft iron vane type**, the **thermo-couple type**, and the **rectifier type.**

The Soft Iron Vane Type A.C. Movement

THE majority of A.C. ammeters employ the **soft iron vane type** movement which is also referred to the **repulsion type.** This movement consists essentially of a fixed coil consisting of a few turns of heavy wire, in the case of ammeter, and a large number of turns of fine wire in the case of the voltmeter. Inside this coil is placed two soft iron vanes, one fixed and one movable. The indicator needle is attached to the movable vane. These iron vanes are magnetized by the field created in the coil by the current under measurement which flows through the coil. They are so located with respect to each other that they become similarly magnetized; that is, the same end of the soft iron pieces become north poles and the opposite ends, south poles. Thus, a magnetic repelling effect takes place between them which tends to move an indicator needle attached to one of the iron vanes over a calibrated scale, thus giving the measure of the current flowing in the coil. The principle of this type of instrument is shown schematically in Figure 47.

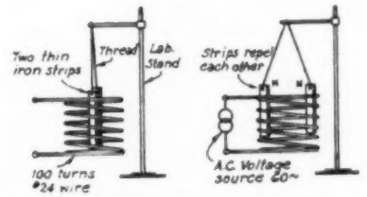


Fig. 47. Basic principle of soft iron vane type A.C. movement

Soft Iron Vane Will Work on A.C. or D.C.

THE soft iron vane type of instrument will work equally well on A.C. or D.C. although they are not quite as accurate on direct current as on alternating current due to a **hysteresis loss** which occurs in the soft iron vane when used on A.C. and which is taken into account in the A.C. calibration. The tendency of the meter would be

to read high when used on direct current.

Thermo-Couple Type A.C. Movement

A VERY versatile type of A.C. instrument is that which utilizes the **thermo-couple** principle. As has previously been explained in this course, when two unlike metals are connected together and their opposite ends connected to a sensitive D.C. millivoltmeter, a voltage deflection is obtained when the thermo junction of the two metals is heated (or cooled). Meters which utilize this phenomenon are referred to as **thermo-couple instruments.** They consist of a thermo-couple, generally constantan and copper, which is located in the back of a D.C. millivoltmeter. The junction of these two metals, is heated by a **heater element** or resistance wire which is soldered to the junction of the two thermo-couple wires. The amount of heat generated in the heater element is proportional to the current flowing through it and this in turn creates a thermo voltage by its being in contact with the thermo junction. Thus, the amount of current flowing in any circuit can be determined by its heating effect on a thermo junction and the corresponding deflection on a D.C. millivoltmeter. Figure 49 illustrates schematically this type of instrument.

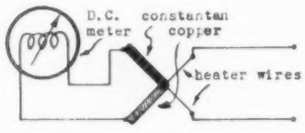


Fig. 49. Basic principle of thermo-couple movement

Frequency Range of Thermo Meter

INASMUCH as the heating effect is virtually independent of frequency, such an arrangement can be used to measure currents of any frequency from a few cycles per second up to several millions of cycles. Thermo-couple type instruments are used chiefly in radio frequency applications such as in broadcasting stations for measuring the antenna, current, etc.

One disadvantage of the thermo-couple type instrument is the fact that it is easily burned out as small thermo-couples can stand but little over-load, whereas the normal A.C. or D.C. meters can generally stand several hundred per cent over-load without serious injury. 25 to 50 per cent over-load will often "burn out" a thermo-couple meter.

Rectifier Type Instrument

ONE of the most popular alternating current instruments is the **rectifier type.** This type instrument is suitable for use on A.C. sources having a frequency of a few cycles per second up to as high as 30,000 cycles per second. Unlike most A.C. instruments, it also has high current sensitivity, being comparable to that of direct current instruments. It should be noted that soft iron vane type A.C. instrument is

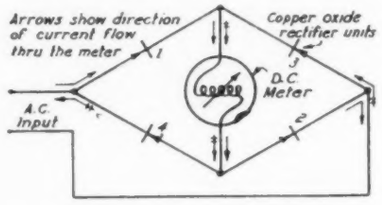


Fig. 51. Basic principle of rectifier type movement

not very sensitive. Most soft iron vane type instruments require ten or more milliamperes for successful operation. Rectifier instruments which will give full scale deflections on less than one-half milliampere are available.

Theory of Rectifier Type Instrument

THE rectifier type instrument consists essentially of a D.C. meter connected to a full wave copper oxide rectifier unit. Figure 51 illustrates schematically how the D.C. meter is connected to the junction of the four copper oxide rectifier units. The theory of operation is quite simple. When alternating current is connected to the input of a rectifier type meter, on the positive half-cycle it flows through rectifier unit No. 1 down thru the meter and back to the opposite side of the line thru rectifier unit No. 2. When the current reverses, it flows thru rectifier unit No. 3 down thru the meter and back thru rectifier unit No. 4. The current flows thru the direct current meter in the same direction on both cycles; hence the direct current meter can thus be used to measure alternating current.

A copper oxide rectifier unit consists of a copper disc, one side of which has been treated chemically so as to form copper oxide. Current can pass from the copper into the copper oxide but not from the copper oxide into the copper. Hence it serves as a one-way path or rectifier. Figure 52 shows the construction of one type of copper oxide rectifier unit.

General Features of Rectifier Meters

AS previously stated, such a meter is useful up to about 30,000 cycles, however, the calibration of these instruments is generally based on 60 cycles and the accuracy falls off as the frequency increases, but they can be used without much correction on frequencies as high as 1,000 cycles. Like D.C. meters, the only difference between the ammeter and the voltmeter is in the amount of series resistance employed. In A.C. voltmeters of the rectifier type sensitivities of 1,000 or 2,000 ohms per volt can readily be obtained whereas sensitivities of 100 ohms per volt is typical of the soft iron vane type A.C. instruments. Radio servicemen use rectifier type meters almost exclusively as they are useful for both direct and alternating current measurement. One meter can serve for both purposes. It should be noted that instruments of the rectifier type when used

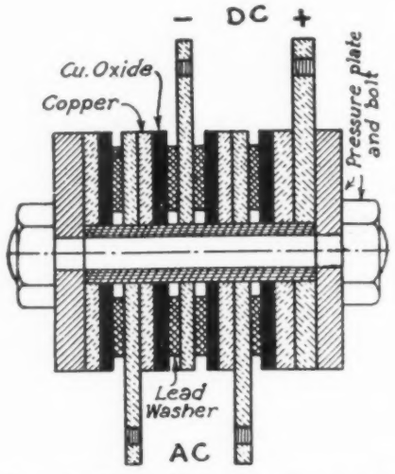


Fig. 52. Enlarged view of construction of copper oxide full wave rectifier

on D.C. generally require a slight change in the circuit resistance in order to compensate for the fact that

Fig. 53. Typical copper oxide meter in multi-range tester

the meter scale is calibrated in **effective volts** whereas the meter deflections are actually proportional to **average volts.** This results in the meter's reading high when used on direct current.

A typical copper oxide meter is shown in Figure 53.

Vacuum Tube Voltmeters

ANOTHER type of meter suitable for use on A.C. sources is the **Vacuum Tube Voltmeter.** This instrument consists essentially of a direct current milliammeter connected in the plate circuit of a vacuum tube. The grid circuit of the tube is connected to the A.C. source to be measused. The tube is biased in such manner that the impressed A.C. voltage produces an increase in plate current, the magnitude of which is proportional to the value of the A.C. voltage under measurement. The D.C. milliammeter is calibrated in terms of effective A.C. volts. A basic Vacuum Tube Voltmeter circuit is shown in Figure 54.

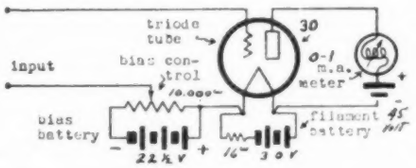


Fig. 54. Basic vacuum tube voltmeter circuit

Actual circuits are more involved but utilize the same general principles. The principal advantages of the vacuum tube voltmeter over other types of A.C. voltmeters is its exceptionally high impedance which permits voltage readings to be taken without drawing appreciable current from the source. A typical Vacuum Tube Voltmeter is illustrated in Figure 55. Vacuum tube voltmeters can be used on either low or high

Fig. 55. Popular type vacuum tube voltmeter

frequency sources. Vacuum Tube Voltmeters are used primarily in laboratories.

Miscellaneous Types Of A.C. Meters

IN addition to current and voltage measurements on A.C. circuits measurements of frequency, power, capacity, impedance, etc. must occasionally be made. Several types of instruments are available for measuring frequency in the low range. There is a tuned reed type unit that is quite popular. It consists of a number of tuned steel reeds of such characteristics that a range of from 20—100 cycles can be covered. An electromagnet located near the tuned reeds is connected to the source to be measured and the resulting electro-magnetic vibration of the reeds causes the reed that is in tune with the impressed frequency to vibrate through a wide arc, thus indicating the unknown frequency.

Frequency meters are also available which consist of several coils acting on a soft iron movable vane and the resulting reaction of the current in the several coils will be proportional to the impressed frequency. Such meters are calibrated to read frequency in cycles directly on a dial.

High radio frequencies are determined by wavemeters (frequency meters) which consist in their simplest form of a tuned circuit in series with some form of current indicating device, as for example a small bulb. The coil is help up close to the source of radio frequency current and the condenser tuned to the resonant frequency. Under this condition current will flow and the bulb will light showing the wavemeter is in tune with the unknown source. The unknown frequency can then be determined from a conversion chart based on the relationship—

$$f = \frac{1}{6.28\sqrt{LC}}$$

Wattmeters, Capacity Meters, Etc.

THE power consumed in an A.C. electrical circuit is measured by a **wattmeter.** There are two types of wattmeters—those which record instantaneous power and those which record kilowatt hours. The latter type is used to measure the power consumed in commercial power lines. Any wattmeter requires both a potential and a current coil. The magnetic flux produced by the two coils acts on the moving member whose deflection is proportional to the number of watts or kilowatts consumed at a given instant. The kilowatt hour meter also employs a potential and current coil and the flux from these acts on a revolving aluminum disk whose speed of rotation is proportional to the volts times amperes consumed.

The total power consumed is recorded on the indicating dial.

Capacity meters are available which enable the capacity of condensers to be read directly and the most popular type meter with the scale calibrated in microfarads. The meter and condensers are connected to a 110 volt 60 cycle source. The current taken by the condenser is proportional to its capacity and the scale is calibrated in microfarads instead of milliamperes. The average power system frequency is sufficiently close to 60 cycles that no error results. Capacity meters which operate on the bridge principle are also used.

Impedance bridges which are similar to a Wheatstone Bridge but which use inductive and capacitative arms are available. They permit both resistance and reactance measurements.

The resistance of an alternating current circuit is not necessarily the same as the direct current resistance due to certain losses resulting from hysteresis and eddy current effects

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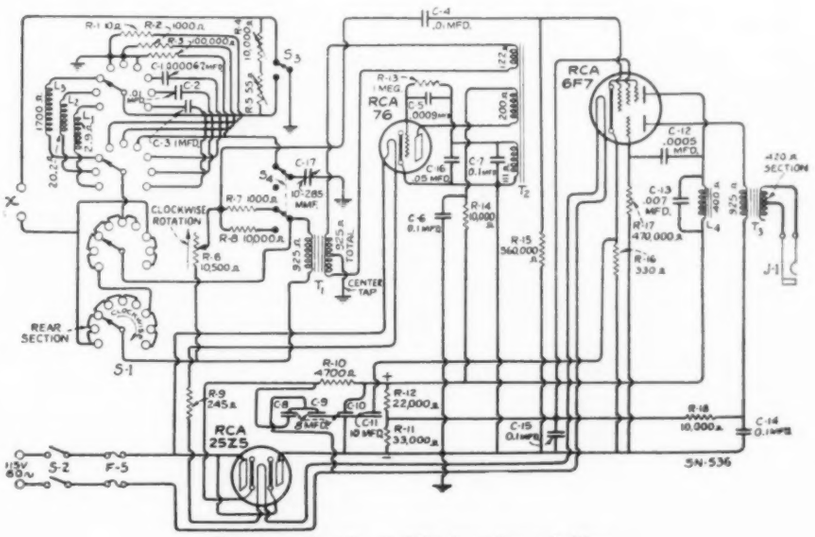

Fig. 59. Circuit of RCA impedance bridge

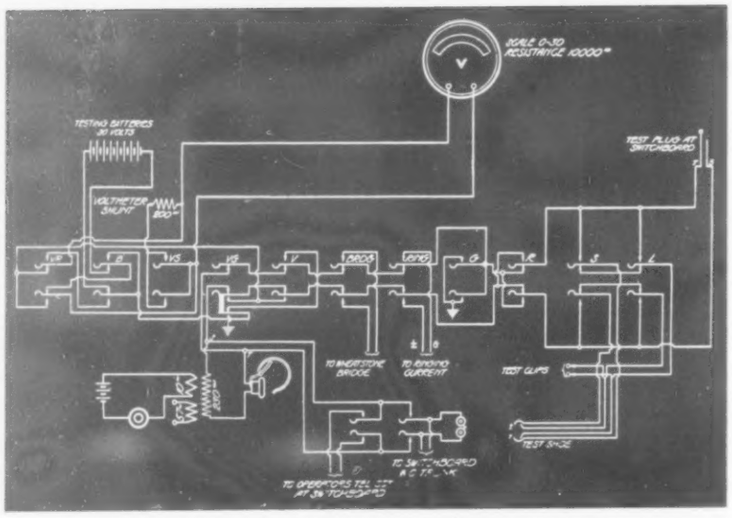

Fig. 1—Circuit of Wire Chief's Test Cabinet.

By J. S. REED, JR.

Locating Trouble on Rural Lines

General:

ONE o the most difficult problems for the average telephone plant man is the maintenance of rural lines. Since most of the lines are open wire, they have little protection from the elements and are subject to damage by adverse weather conditions unless they are exceptionally well constructed. Even when well maintained, the life of an average farm line seldom extends beyond fifteen years.

The condition of rural lines is an important factor in the kind of service rendered to farm subscribers. Each line furnishes a circuit which connects as many as fourteen subscribers, in extreme cases, to the central office. Any defect in the line will result in poor service to all subscribers on this line.

It is important then that plant maintenance men be on the altert for faults in wire lines and clear them as soon as possible.

Methods of Handling Wire Troubles

TO insure that every fault will be tracked down and cleared without delay, the telephone office should have an efficient system of handling cases of trouble. Simple but efficient written records should be kept of every case of trouble reported by subscribers or the operating room force. Means should be provided for quickly relaying trouble reports to the wirechief so that he can make necessary tests and dispatch his assistant to locate and clear the faults reported.

Good testing equipment should be provided for locating practically any kind of trouble encountered in line maintenance. Unless the office is very small, it should have a wire chief's test cabinet which saves much time by enabling preliminary tests from the office to determine (1) if the trouble is inside or outside the office, and (2) what the nature of the fault is.

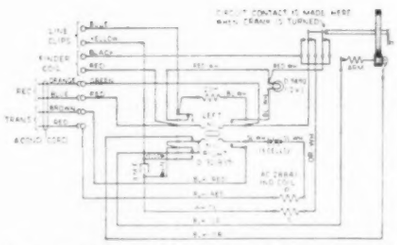

Fig. 3—Circuit of Magneto Test Set of Inductive Fault Finder Type.

For testing on the line in trouble, a magneto test set is needed. This may be a simple set with generator, buzzer, receiver, and transmitter, or one equipped in addition to these items with an inductive fault finder coil. An ohmmeter is also very helpful for certain kinds of tests, especially for continuity tests of subsets and for checking resistance of line splices suspected to be defective.

Types of Wire Troubles

BEFORE discussing the use of testing equipment in locating trouble on rural lines it is well to list the various

DEFLECTION OF VOLTMETER IN VOLTS	WITHOUT SHUNT EXTERNAL RESISTANCE IN OHMS IS	WITH SHUNT EXTERNAL RESISTANCE IN OHMS IS	DEFLECTION OF VOLTMETER IN VOLTS	WITHOUT SHUNT EXTERNAL RESISTANCE IN OHMS IS	WITH SHUNT EXTERNAL RESISTANCE IN OHMS IS
1	290000	5670	16	8750	156
2	140000	2730	17	7650	135
3	90000	1760	18	6665	116
4	65000	1280	19	6750	99
5	50000	965	20	5800	83
6	40000	770	21	4985	69
7	32850	630	22	3885	56
8	27500	525	23	3245	45
9	23330	440	24	2700	35
10	20000	375	25	2000	24
11	17275	325	26	1490	15
12	15000	280	27	1170	6
13	13075	240	28	915	0
14	11430	210	29	245	-
15	10000	180	30	195	-

Fig. 2—Chart for Converting Voltmeter Readings to Ohms (for use with o-30 volts D. C. Voltmeter, 10,000 ohms resistance).

types and definitions of line trouble. These are as follows:

OPEN CIRCUIT—A break in the continuity of the line circuit.

SHORT CIRCUIT—The two conductors of a line pair crossing together.

CROSSED CIRCUIT—The coming together of the wires of two separate line circuits.

GROUNDED CIRCUIT—One wire of a line circuit coming in contact with ground.

LEAKAGE—Poorly insulated condition of line circuit.

LOOSE CONNECTION—A loosely made splice in a line wire.

HIGH RESISTANCE CONNECTION—A joint in the line that has a high resistance to the passage of electric current as the result of corrosion of the joint wires.

INTERMITTENT CONNECTION—A connection in the line that alternately becomes high resistance and returns to normal.

CROSS TALK—Subscriber conversation on one line heard on one or more other lines due to lack of transpositions or the presence of high resistance joints causing unbalance.

FOREIGN POTENTIAL—A dangerously high voltage induced into a telephone line from a very high voltage power line in close proximity or caused by a direct cross with a power line of comparatively low voltage.

INDUCTIVE INTERFERENCE or LINE HUM—A noisy condition of the line due to induction from power parallels.

The Wire Chief's Test Cabinet

THE wire chief's test cabinet contains an 0 to 30 volts D. C. voltmeter of 10,000 ohms, resistance and keys for connecting the meter in various test arrangements across the line and between either side of the line and ground. A 30-volt battery is used in series with the voltmeter for resistance and continuity tests. Figure 1 shows the schematic of a typical wire chief's test cabinet.

There are several ways of connecting the test cabinet to the line, namely, (1) a test cord with universal clips that can be connected to lug terminals on the main frame and that is connected to the test cabinet circuit by means of a key, (2) a test shoe that plugs into a protector unit on the main frame (operate key L for testing out and key S for testing in the office), and (3) a test plug at the switchboard which is plugged in any desired line by the operator at the request of the wire chief who uses an order wire connected directly to the operator's headset.

The purpose of the various keys are explained as follows:

VR—To reverse voltmeter connection if operation of the V key causes the meter to deflect off scale.

B—Disconnects voltmeter from series battery for foreign potential tests.

VS—Connects shunt across voltmeter for low resistance tests.

VG—Connects voltmeter between ground and one side of line for ground tests.

V—Connects voltmeter and battery in series across the line for resistance tests.

BRDG—Connects wheatstone bridge across line for accurate resistance measurements in offices having this type of instrument.

RING—Connects ringing current to line for ringing subscribers on line checks.

G—Connects one side of the line to ground.

R—For reversing line in ground tests.

When using the voltmeter in making resistance measurements, the following equation is utilized:

$$R_x = \frac{(E - V)}{V} Rm$$

Where R_x = resistance across the line; E = voltage of series battery; V = voltmeter reading in volts; Rm = resistance of voltmeter in ohms. Figure 2 illustrates a conversion chart that gives voltmeter readings in terms of resistance in ohms for the type of voltmeter discussed in this article.

Use of Magneto Test Set with Inductive Fault Finder

THE magneto set with inductive fault finder provides a convenient means of locating trouble on open wire rural lines without the need of opening a line wire. This set is useful for locating the following kinds of faults: opens, shorts, grounds, crosses, righ resistance joints, and poor ground connections.

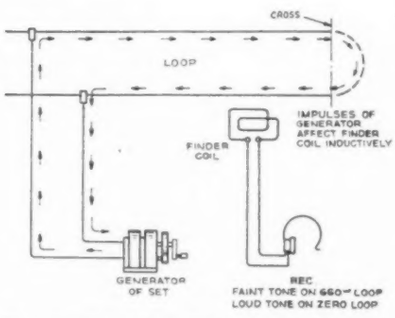

Fig. 4—Operating Principle of Magneto Test Set with Fault Finder Coil.

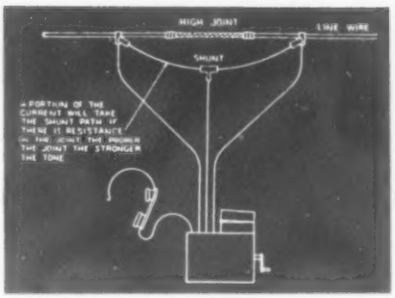
HIGH JOINT
LINE WIRE
SHUNT
A PORTION OF THE CURRENT WILL TAKE THE SHUNT PATH IF THERE IS RESISTANCE IN THE JOINT THE HIGHER THE JOINT THE STRONGER THE TONE

Fig. 7—Illustrating the Method of Checking Splices in Line Wire with the Magneto Test Set.

The test set consists of a small generator, battery, induction coil, 4-m.f. condenser, compact hand unit with receiver and transmitter, 12-volt test lamp, inductive fault finder coil, and lever operating key arranged in the circuit shown in Figue 3.

The theory of operation of this set is illustrated in Figure 4. The tone is produced by a generator which charges the 4-m.f. condenser and then discharges the capacity peaks from the condenser through a special commutator into the line. The tone flowing into the line toward the short or other form of connection is induced into a finder coil placed over one of the line wires. The magnetic field produced by the tone current cuts through the winding of the finder coil, generating a current which actuates the receiver in series with the coil.

In Figure 5, connections are shown for a short-circuit test on an open wire line. The two line clips of the test set are connected to the line and the finder coil is then clamped over one of the wires. The generator crank handle is turned to produce the tone current. If the tone is heard, the fault is on that side of the line. No tone or only a weak tone will be heard if the finder coil is clamped over the line wire on the other side of the test clip. The loudness of the tone on the fault side of the line

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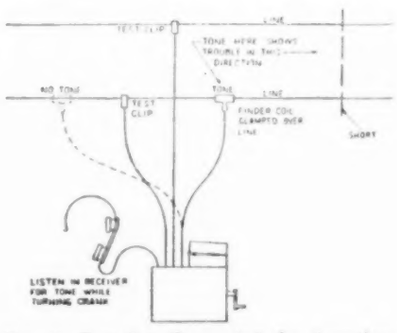


Fig. 5—Test Set Connected for Locating a Short.

Capua, Italy. Linemen of the Signal Construction Battalion, attached to an Air Support Command, string wire at Capua, Italy.

Venafro Area, Italy. Men of the Regiment pack equipment and supplies on mules for a pack train trip to troops in Italian mountain positions.

Report of Communications on The Italian Campaign

Roland C. Davies, our Washington correspondent, condensed this report of Colonel J. T. Tully, Deputy Chief Signal Officer of the Allied Forces Headquarters Italy, for our readers. All illustrations were made by Signal Photo companies of the Signal Corps.—Editor.

THE establishment of the communications facilities, both wire and radio, for the now battle-experienced Fifth Army, led by Lieutenant General Mark Clark, has achieved a record of not only unprecedented installations under combat conditions, but the performance of many deeds of heroism by Signal Corps personnel during the sanguinary days and nights after the Allied spearheads of this first truly great international American field Army of this war set foot on Italian soil.

During the first twenty-two days of the invasion, the Signal Corps units had installed a grand total of 5,305 miles of assault wire, field wire and cable. This average of better than 240 miles of line laid per day will probably stand unequalled in the history of communications until the final, all out assault on Hitler's Europe, according to a report from the Italian front just received by the War Department.

Prata Area, Italy. Signal Battalion improvised construction truck showing methods of laying cables.

Radio, of necessity, was employed initially in all operations of the Fifth Army, including the bitterly-contested beachhead landings at Salerno and Paestum. But today as the troops of the Fifth Army press slowly but surely on toward Rome, an extensive network of wire is being laced in behind them. The report noted that the cobweb of wire is so interspun that to attempt to estimate accurately the thousands of miles of the metallic thread that gives ready, dependable communication would be an impossible undertaking.

In the beachhead landings, numerous small portable radio sets were carried ashore by the invading troops even in the face of withering enemy fire as at Salerno. Higher-powered radio units, housed in especially-constructed shelters and mounted in the Army's prize amphibious vehicles—the DUKW, or DUCK, as it is more commonly known—were lowered over the sides of invasion vessels, churned through the waters of the

Salerno Gulf and lumbered up the hostile shore.

The three most difficult obstacles in the military communications problems of the Fifth Army were those that confronted all branches of the attacking force. They were: the landing and securing of beachheads on hostile shores; river-crossings in enemy-held country which meant Signal Corps troops often had to tie sections of wire or cable and swim across icy Italian rivers during enemy fire; and combat in mountainous terrain under the most extreme weather conditions which more nearly parallels that of the Aleutian campaign than any other front yet encountered by the American troops in this war.

Pignataro Area, Italy. Pvt. Henry V. Lineberry, lineman, makes switchboard installation on regimental board. Note camouflage.

Communications Planning

IN the landings at the beachheads, particularly Salerno, a considerable proportion of the credit for the success of the landings must be attributed to the fact that every ranking staff officer in the Fifth Army, American or British, from the Commanding General down, realized the vital necessity of excellent communication and to that end worked hand in hand with the Signal Section right through the planning phase to the accomplishment of the attack. The report of the War Department cited that the Signal Section Chief enjoyed the complete confidence of all with whom he worked and therefore made advanced preparations to meet every possible emergency. At Salerno, these arrangements proved their worth because of the landing having been anticipated by the enemy and more than one plan had to be scrapped in the heat of battle for an alternate communication scheme.

With malice aforethought, the report stated, Signal supplies and operating personnel went ashore from several widely-separated craft of the invasion fleet which was done to forestall the possibility of a chance torpedo or aerial attack delivering a knock-out blow early in the game. General Clark, with one complete Signal complement, made the over-water journey from North Africa aboard headquarters ship, while the Deputy Signal Officer with his operating team, went ashore from a vessel utilized as an alternate command ship. Radio and wire units were landed from numerous other craft in the beachhead operation.

Wire Still Stands As No. 1

IT was readily established in the opening hours of the Salerno landing that wire still stands as the number one agency of Signal communication, once ashore. Army headquarters, nevertheless, remained in constant radio contact rearward to Sicily and Africa. The smaller units of the landing force relied solely on radio in the opening stages and the sets performed remarkably, constituting a tribute to the Allied equipment and waterproofing methods which resulted in the radio apparatus reaching the beaches in operating condition despite the rough handling occasioned in the ship-to-shore movement of this materiel.

In the Italian combat operations the problems of communication increased with inclement weather and geographical obstacles. Whereas in previous campaigns linemen worked normally from standard military vehicles, constructed for this express purpose, in these operations, Jeeps, mules, carts and even bicycles were pressed into service. In nine cases out of ten, wire went in by hand with several members of a Signal Corps team alternating at packing the drums while others tied in and established switchboard positions and test terminals. More than often, two to four members of the team would be detailed to patrol and protect the men at work.

Main wire routes in the Italian operations extended along roads were possible, under almost excellent enemy observation and no less accurate artillery fire. While military doctrine has taught that the Signal Corps will not lay line beyond the division posts in combat, there have been repeated cases where wire teams have been obliged to go in ahead of Ranger and other assault troops with their telephone lines. Once-arrived at a previously designated position, it was often necessary for the Signal units to dig in and await the arrival of the shock troops.

Radio Team Fights Over German Attack

BESIDES the wire facilities on the combat fronts in Italy, radio links are most numerous and highly important communications media. For example, the radio sets travel right to the advanced positions of the troops. It was interesting to note that when a heavy German attack was launched north of the point where Highway 18 crosses the Sele River, sixteen powerful radio sets had just been installed and linked with supporting nets. The Nazi attack was suc-

(Please turn to page 60)

Capua Area, Italy. Linemen of a Signal Construction Battalion, attached to an Air Support Command, string wire.

An Invitation!

THE OCCASION: Executives Spring Conference on War Problems

THE TIME: April 20-21

THE PLACE: Edgewater Beach Hotel, Chicago

By CLYDE S. BAILEY,
Executive Vice President, USITA

Clyde S. Bailey

THE 1944 Executives Conference on War Problems will open at the Edgewater Beach Hotel in Chicago at 10 a. m. on April 20. It will be a two-day streamlined meeting devoted to our major current and postwar problems.

No active telephone executive can afford to miss the important discussions that will take place at this conference. These are momentous days. More of them are ahead of us. We are admonished to chart our course carefully. That is one of the principal purposes of the conference.

The more pressing problems confronting telephone executives will be dealt with by means of panel discussions. These panels will consist of men who are specialists in their respective subjects. The specific subjects to be treated by the three panels are:

1—Manpower, employment relations, wage and hour problems.

2—The tax situation.

3—Priorities, instrument shortages, and postwar planning.

The panel discussions will be thought-provoking. They are designed to be helpful to the busy executive and to assist him in solving his problems on the home front.

In addition to panel discussions our Advertising Committee will disclose its concrete proposals for giving the Independent industry a more consistent and uniform advertising policy,—one which we shall hope may in a measure do for us what the advertising policy of the Bell System has done for it.

The effect of the Western Union-Postal telegraph merger upon Independent telephone companies will come in for discussion and our Telegraph Committee will have some policy recommendations to place before the conference.

Current developments affecting depreciation, continuing property records, reduction in interstate toll rates, and hotel surcharges will be reviewed. Plant, traffic, accounting and commercial matters of major current interest to executives will be brought to the attention of the conference.

Ample opportunity will be afforded to those in attendance to submit their own ideas and to ask questions.

Let me urge you to begin making your plans now to attend this conference. This means that you should make your rail and hotel reservations without delay. Plan to get the utmost out of this gathering!

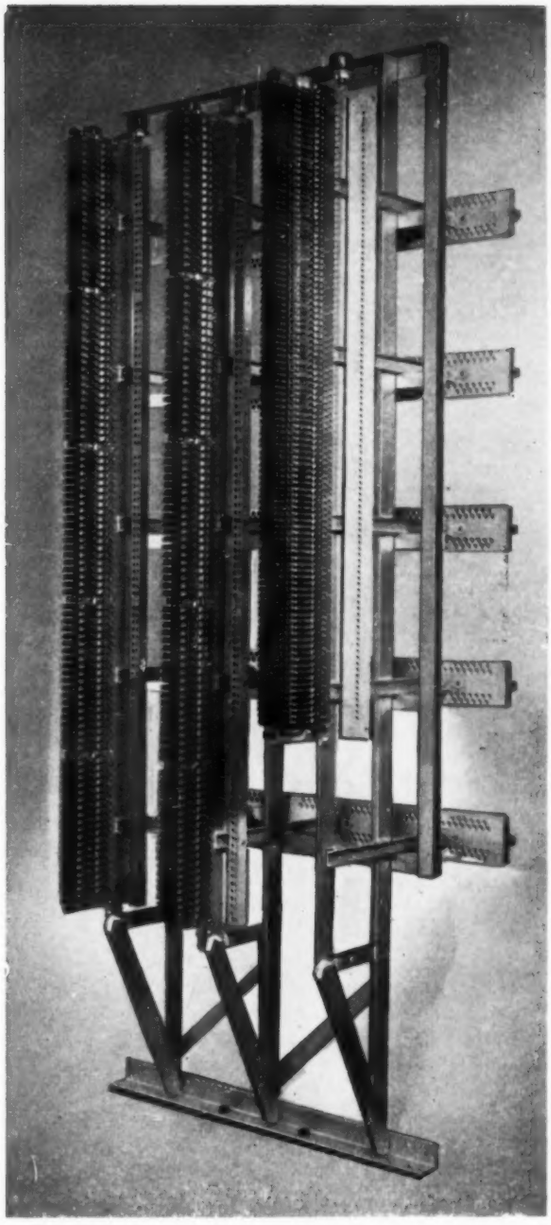
Presidents, vice presidents, heads of plant, traffic, commercial and accounting departments and other key Independent telephone men—let's go!

Of course, we want the manufacturers and suppliers, too. We can't get along without them.

YOU WILL WANT THE BEST...

When the time comes to make a selection of your new distributing frames, you will make your selection with great care and consideration. Looking at it from a standpoint of engineering and design, Cook's almost fifty years' experience in the telephone field is your guarantee of performance. Considering your selection from the standpoint of precision manufacturing, look to Cook's modern plant and experienced craftsmen to meet your demands; and finally, from the standpoint of dependable service—well, Cook's reputation in the field speaks for itself.

You'll be proud of your Cook equipment, and we'll be proud to have you select it.



Type L Main Distributing Frames are furnished either welded or knocked down and bolted. These frames are also exclusively equipped with a special alarm circuit for signalling heat coil operation. Protectors afford a convenient means for testing both outside lines and switchboard circuits and cutting them in and out of service.

Send for the Cook catalog for complete details on this item and all Cook Electric Company telephone products.

ARMY E NAVY

COOK ELECTRIC Company

Telephone Protection & Distribution Engineering Since 1897

2700 SOUTHPORT AVENUE • CHICAGO 14, ILLINOIS

New Group Formed by General Telephone Corporation

Edwin M. Blakeslee

Frank O. Cuppy, now president of Indiana Associated Telephone Corporation, will, under the provisions of the pension plan of that company, retire from active service on June 30, 1944. Effective March 15, 1944, he has been elected Chairman of the Board for the remaining period of his active service with the company.

Also effective March 15, 1944, Edwin M. Blakeslee, now vice president and assistant group manager of the Central Group operating properties of the General Telephone System, has been elected president of Indiana Associated Telephone Corporation to succeed Mr. Cuppy. Effective the same date, Mr. Blakeslee has also been elected president of Michigan Associated Telephone Company, Lexington Telephone Company, Indiana Standard Telephone Company and College Corner Telephone Company, and these five companies will constitute a new group in the General Telephone System with executive headquarters at Lafayette, Indiana. Within the System, the group will be known as the East Central Group.

The American Red Cross is training an additional group of volunteers, called dietitian's aides and Gray Ladies. Help the Red Cross maintain and increase its service on the home front by supporting the 1944 Red Cross War Fund.

Also effective March 15, 1944, Burton W. Saunders, vice president and general manager of Lexington Telephone Company, has been made vice president and general manager of Indiana Associated Telephone Corporation, and L. O. Evenson, long with the Indiana company and more recently group commercial superintendent for the Central Group, has been named vice president and general manager of Lexington Telephone Company. Mr. Saunders will remain a vice president of Lexington Telephone Company and has also been named a vice president of Michigan Associated Telephone Company, of which H. R. Christianson is vice president and general manager.

Clarence D'Aoust, general auditor for the companies in the Central Group, with headquarters at Madison, will move to Lafayette as general auditor for the companies in the East Central Group.

Ray Kieran, former equipment engineer of Commonwealth Telephone Company, Madison, Wisconsin, and for the past two years district manager for the Army and Navy Electronics Production Agency of the War Department, Chicago, Illinois, has been named chief engineer of Indiana Associated Telephone Corporation and also Michigan Associated Telephone Company and Lexington Telephone Company, with headquarters at Lafayette, Indiana.

Harry P. Karnes, commercial superintendent of Indiana Associated Telephone Corporation, Lafayette, Indiana, has been designated group commercial superintendent for the East Central Group of properties of the General Telephone System.

Edwin L. Malone, who has been commercial superintendent of Lexington Telephone Company, Lexington, Kentucky, has been designated district manager of Indiana Associated Telephone Corporation at LaPorte, Indiana.

Charles M. Rice, now district manager at LaPorte, goes to Logansport to take over the duties of Wilbur H. Van Horn, Logansport, district manager, who will replace John W. Troyer, district manager at Elkhart, who is soon to retire under the provisions of the company's pension plan.

D. H. Lloyd, local commercial manager of the Lexington exchange of Lexington Telephone Company, has been designated commercial superintendent of the company, succeeding Mr. Edwin L. Malone.

Frank O. Cuppy

Carl R. Willis, traffic superintendent of Lexington Telephone Company, has been designated group traffic superintendent of the East Central Group of the General Telephone System, comprising the Michigan, Indiana and Kentucky properties, and will maintain his headquarters at Lexington, Kentucky.

Can You Beat This!

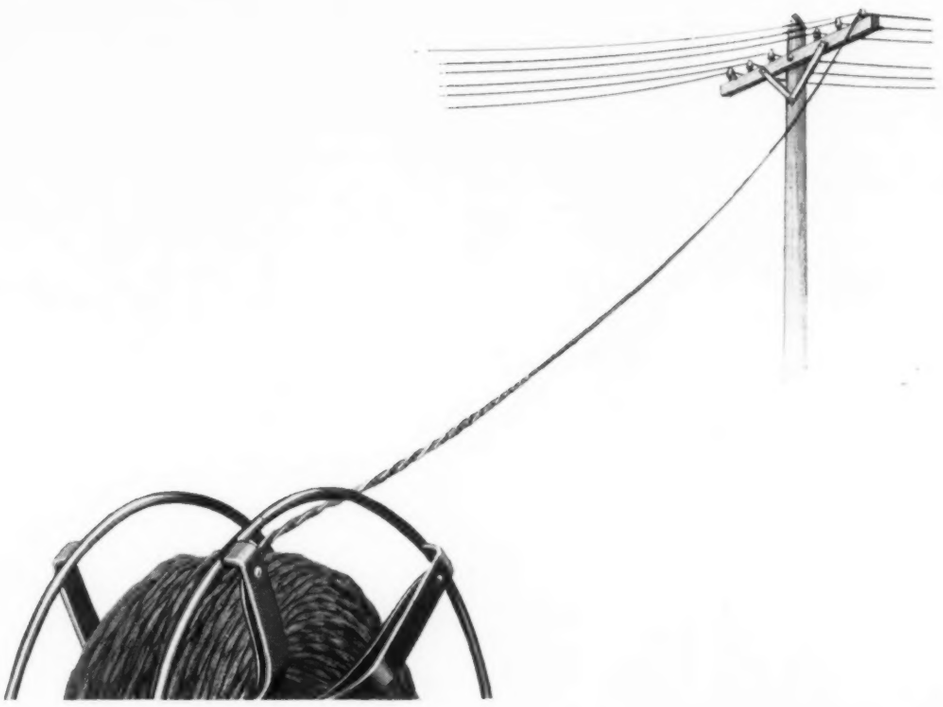
The USITA in its latest bulletin includes this interesting item:

"The Inter County Telephone and Telegraph Company, Fort Myers, Fla., seems to be doing a big job for the military. The company has a plant investment of slightly over two million dollars. President Gillentine in a letter to us says: "We have been required to furnish facilities by building lines and trunks as far out in the country as 16 miles to furnish service to 12 aviation training fields in our territory and three Coast Guard stations." President Gillentine continues:

"Our long distance traffic has increased more, by 125%, in 18 months than it had developed in total in the previous 18 years. The long distance traffic on our lines is the heaviest that I have ever known in 43 years of telephone experience. The toll gross revenue per telephone at the present time is averaging above $6 per station, per month. So far as I know, this has never been equaled in telephone history."

"Mr. Gillentine has asked us if we know of any other company of similar size with a comparable record. Do you know of any?" If so, write USITA!

Right Off the Reel



MONOTYPE DROP WIRE

You ***know*** you've bought quality, when Monotype Drop Wire pays off the reel. Its tight, firmly braided covering is ***twice***-coated to battle weather and moisture, and slicked smooth with a generous dusting of mica. It is clean and easy to work with. It looks right, it handles right—it IS right. Monotype Drop Wire will reward your judgment with years of satisfactory service. When you ***must*** buy drop wire, be sure to get Monotype quality. And please order well in advance of anticipated requirements.

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AUTOMATIC ELECTRIC COMPANY
By GENERAL CABLE CORPORATION

DISTRIBUTED BY

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For War or Peace ...

Drop wire and line wire are scarce. You can make the most of what you have by using Nicopress Splicing Tools and Sleeves, a combination that produces splices stronger than the wire itself.

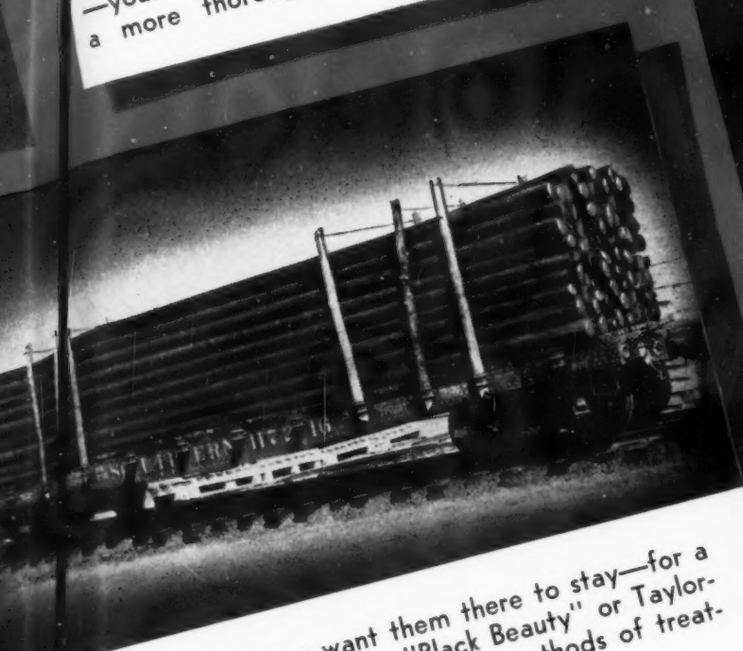
You can save manpower with this one-man trouble shooter—the West Test Set. Locates all kinds of line faults with maximum speed and accuracy.

Equip your linemen with these better safety devices. Klein Safety Belts, Straps and Climbers are noted for their dependability under hard use.

For better work on cable repairs and construction, we recommend Drierite Desiccant, Alligator Cable Wrapping Cloth, Ruberoid Asphalt Paint and other fine materials for insulation and protection.

.OOD SUPPLIES LAST LONGER . . . SERVE BETTER

With these tools—Estwing Hammers, Yankee Screwdrivers and Klein Pliers —your linemen can work faster, do a more thorough, workmanlike job.



hen you set poles you want them there to stay—for a g while. They will if they're "Black Beauty" or Taylor-olquitt, since both brands use latest methods of treat-nent to insure long, rot-free life.

Newman Tree Trimmers and Pruners will help you keep your lines free and clear. Especially designed for fast, clean-cutting action with minimum effort.

It pays to use these dependable Hemingray and Whitall-Tatum Insulators, and Pearl Drop-Wire Brackets.

AUTOMATIC ELECTRIC

ORIGINATORS AND DEVELOPERS OF STROWGER STEP-BY-STEP MACHINE SWITCHING AUTOMATIC DIAL SYSTEMS

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

Distributors in U. S. and Possessions:
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Personalities

Edwin M. Blakeslee, head of the newly formed East-Central group of the General Telephone system and chairman of the USITA Toll Compensation Committee, called a meeting of that committee which met March 2 and 3 in Chicago.

●

T. DeWitt Talmage, communications engineer of the TVA and one of TELEPHONE ENGINEER'S crack writers of past years, has been seriously ill following an appendectomy. He is now convalescing and well on the road to recovery. **Mr. Talmage** will be remembered by members of the Illinois Association as their former transmission engineer of the Illinois Telephone Association.

●

Ted Frayser and **Nick Riggs** have purchased the Cave-in-Rock (Ill.) telephone exchange from the village board who have owned and operated the exchange for the past several months. Purchase price was $400.

●

Mrs. Kate Thayer has been named manager of the Fredericksburg, Ia., office of the Iowa State Telephone Company.

●

Dan Ravenal, of the Taylor-Colquitt Company, reported February 13 to the U. S. Maritime School at New London, Conn. He will serve in the Merchant Marine.

●

Frank Diederich, 63, manager of the Granville (Ia.) Telephone Association, passed away January 29 after a lingering illness. During his life time **Mr. Diederich** built and operated the first electric plant in the Granville community.

●

J. W. Hannon, former general plant manager of the Indiana Bell Telephone Company at Indianapolis, has been appointed plant construction engineer for the American Telephone & Telegraph Company at New York.

R. A. PHILLIPS

R. A. Phillips, chairman of the USITA committee on advertising, called a meeting of that committee and met with them in Chicago on March 2. Members of the committee and subcommittee from all over the country were in attendance and plans were completed to submit to the directors of the USITA at their meeting during the Spring Conference in Chicago April 20 and 21.

●

W. E. Wilkin has been named manager of the Minnesota Community Telephone Company with offices at Waterville, Minn. He succeeds **C. W. Gottry** who is now manager of the Missouri Telephone Company at Columbia, Mo.

●

William C. Moodie has been elected president of the Calculagraph Company, Harrision, N. J. succeeding the late **Henry Abbott** who founded the company 52 years ago. **Harold B. Thomas** was elected treasurer and a director. Both new officers have been associated with the management in the manufacturing field for many years. The Calculagraph Company manufactures timing devices and other instruments widely used in the public utility field and by industrial plants.

●

Joseph E. Byrne, recording secretary of the Wisconsin State Telephone Association, is pointing with pride to the ten telephone companies which have joined that association since January 1. Following his announcement **Joe** waxed poetic with the following: "Orchids, roses and a big welcome to you, and we still have some left for more new members, too."

●

M. E. McIntosh, Covina, Calif. manager of the Associated Telephone Company Ltd. and **Mrs. McIntosh** are doing their share in the war effort. They are maintaining a fifteen room house in Covina and have named it Hospitality House for soldiers from nearby camps. Supplies and rent are donated free. Parties are being held regularly.

●

Roy F. Smith, our advertising manager is now attending the annual convention of the Texas Telephone Association. He informs us the TELEPHONE ENGINEER camera has been doing double duty and pictures of the convention will appear in the April issue of Fortnightly TELEPHONE ENGINEER.

●

H. L. Conter who was acting as manager of the Citizens Telephone Co. of Decatur (Ind.) during the period of military service of **Chas. D. Ehinger,** died suddenly of heart failure on Jan. 16. Following **Mr. Conter's** death **Mr. Ehinger** was granted a short leave from his military duties to return to Decatur to adjust the affairs of his company.

●

John C. Morin, secretary-treasurer and general manager of the Brookville (Ind.) Telephone Co. died at Brookville on January 31. **Mr. Morin**

was 75 years of age and had been identified with the telephone company for about 35 years.

•

Chauncey K. Conklin was recently elected president of the Warwick (N. Y.) Valley Telephone Company following the death of the former president **Mr. Strong.**

•

J. N. Johnson, president of the Kentucky Independent Telephone Association, is doing a real sales promotion job selling that Association's annual convention at Lexington, Kentucky on April 5. The one day meeting starts at 9:30 a. m. at the Lafayette Hotel and will continue all day and into the evening.

•

Norman Ott of the Lincoln (Nebr.) Tel. & Tel. Co., died suddenly during February. In the February issue of the Lincoln Telephone News, which **Mr. Ott** edited before his death, **John H. Agee,** vice president and general manager of the company, wrote one of the nicest eulogies to **Mr. Ott** we have ever read.

•

W. E. Dunn has been appointed manager of the Hazard district of the Ashland, Ky. Telephone Company according to **J. W. Johnson.**

•

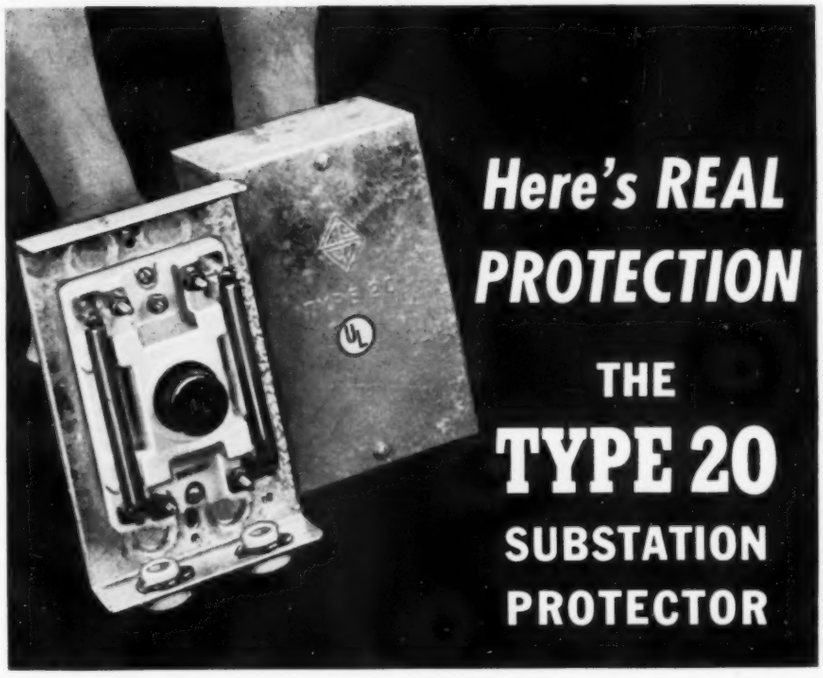
Lt. John E. Fogarty, *27,* a fighter pilot in the U. S. Army air corps, who was a lineman in the Nebraska-So. Dak. area plant construction department of the Northwestern Bell Telephone Company, was killed in an airplane crash in New Guinea on Jan. 13. **Lieut. Fogarty** had recently been awarded the Air Medal for completing twenty-five missions as a fighter pilot in the South Pacific. He came from a telephone family.

•

Ray C. Krueger, advertising manager of the Kellogg Switchboard & Supply Co., calls our attention to page 55 of our February issue. The U. S. army photo showing the new type lip microphone carries as standard equipment Kellogg Koiled Kords which are discussed in another part of this issue.

•

Major Giles Gere, formerly of the Lincoln (Nebr.) Tel. & Tel. Co. is now serving in the armed forces abroad. In a letter from Teheran, Iran, to a former fellow employee, he told of the necessity to devise special wire sag tables as it is necessary to string wire in temperatures of 130 to 160 degrees in the sun.



Just hold this protector in your hands, and you get the feel of real protection. The massive porcelain block provides large and sturdy barriers between all terminals, to prevent current leakage over the surface of the porcelain. Discharge blocks are set into a deep well in the center of the block, and covered with a screw-on cap of molded plastic. It's an arrangement that provides maximum separation between current-carrying parts—hence, greatest protection.

USE IT INDOORS OR OUTDOORS

For indoor installations, the Type 20 Protector is supplied without cover. For outdoor use, it is provided with a big cover, built and finished to battle the weather for many years. (Covers can also be supplied separately, for quick, on-the-job conversion from indoor to outdoor mounting.)

LISTED BY UNDERWRITERS

The Type 20 Substation Protector is made and guaranteed by Automatic Electric Company. And it is listed by Underwriters' Laboratories, Inc.—your further assurance of adequate protection.

Send for Catalog 4068-A, "Automatic Electric Telephone Protection Apparatus"

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telegram, subject to the terms on back hereof, which are hereby agreed to

1944, FEB. 17

TO OUR CUSTOMERS:

CONTINUING OUR SURVEY OF THE PRACTICES, CONDITIONS AND PROCEDURES THAT HAVE BEEN EXISTENT IN THE WIRE AND CABLE INDUSTRY OVER A PERIOD OF YEARS, WE ARE SATISFIED THAT THE ELIMINATION OF SOME OF THESE POLICIES CANNOT HELP BUT RESULT IN SUBSTANTIAL BENEFITS TO ALL BRANCHES OF THE ELECTRICAL INDUSTRY, TO ALL CUSTOMERS AND TO THE GENERAL PUBLIC. AS OUR STUDIES DEVELOP THE NEED FOR CORRECTIVE MEASURES, WE WILL, IN LINE WITH OUR CONSISTENT POLICY, PROMPTLY INSTITUTE SUCH CHANGES AS EXPERIENCE AND CONSIDERED OPINION WARRANT.

AT THIS TIME WE FEEL IT INCUMBENT UPON US TO ASSUME "CLEARANCE OF THE DECKS" IN RESPECT TO REELS, SPOOLS AND CASES WHICH ARE USED FOR THE SHIPMENT OF PRODUCTS OF OUR MANUFACTURE.

EFFECTIVE MARCH 1, ALL GENERAL CABLE CORPORATION CONTAINERS WILL BE SHIPPED ON A "NO CHARGE" BASIS AND NO PAYMENT OR DEPOSIT WILL BE REQUIRED.

WE HAVE CONFIDENCE THAT OPERATION OF THIS PLAN WILL RECEIVE THE SUPPORT AND COOPERATION OF ALL PARTIES AT INTEREST, ELIMINATING AS IT DOES THE PRESENT COSTLY AND MANPOWER-CONSUMING METHOD OF HANDLING CONTAINERS. IT IS REQUESTED THAT ALL GENERAL CABLE CORPORATION RETURNABLE TYPE CONTAINERS BE RETURNED PROMPTLY, FREIGHT COLLECT.

WE WILL ALLOW CREDIT FOR THE RETURN OF ALL CONTAINERS YOU HAVE BEEN BILLED FOR AS CONTAINERS AND WHICH YOU HAVE PAID FOR, PROVIDED THEY ARE RETURNED IN GOOD CONDITION ON OR BEFORE FEBRUARY 28, 1945. AFTER THAT DATE, NO CREDIT WILL BE ALLOWED FOR THE RETURN OF CONTAINERS.

THE COOPERATIVE EFFORT OF ALL CONCERNED WILL DETERMINE THE EFFECTIVENESS OF OUR POLICY AND OF OUR ABILITY TO CONTINUE IT.

GENERAL CABLE CORPORATION....

C O R P O R A T I O N

EDITED BY J. S. REED JR.

Line AND Desk

Q. Do you know of any method by which wet cable can be automatically detected, that is, without waiting for complaints to come in when telephone service is interrupted by this type of fault?

A. The only method we have heard of for locating wet cable by automatic indication at the central office makes use of a sensitive relay connected to one of the extra pairs in the main exchange cable. At each junction box the extra pair is strapped onto the extra pair in the main cable. A pilot lamp is arranged to light on operation of the sensitive relay whenever a wet place in the cable develops. The particular branch in which the fault occurs is found by opening up each of the strips at the junction boxes until the extinguishing of the pilot light at the central office indicates the presence of the defective branch. We do not consider the automatic fault indicator to be wholly reliable as wet spots may develop in a cable without affecting the pair connected to the indicator.

Q. Will you give us a few instructions for the care and operation of gasoline torches that will enable us to get the maximum performance out of them?

A. The first and foremost precaution to observe in the care of gasoline torches and furnaces is to utilize only **white** gasoline, never Ethyl or other treated gasoline for the fuel. Use kerosene only if the torch is specifically designed to burn this type of fuel. When refilling the tank, use a funnel with strainer to keep dirt or other foreign matter out of the fuel and prevent clogging. Fill the tank only three-quarters full to leave sufficent air space for pumping up the required pressure.

When using the torch, pump several times and open the valve sufficiently to allow the priming cup to fill about half full. Shut off the valve and light the fuel in the priming cup. When the fuel is completely burned out, the generator will be sufficiently heated to vaporize the gasoline which will then ignite readily on turning the valve and applying a lighted match. Allow the torch to burn at low pressure to thoroughly heat the generator and then pump until the intense blue flame is about six inches in length. The flame can then be adjusted to the desired length by turning the valve. When shutting off the torch, do not tighten the valve handle, as this action may force the needle point against the valve seat, and permanently enlarge the heated generator orifice. An enlarged orifice will pass too much gasoline, preventing it from vaporizing completely so that the generator "spits" raw flaming fuel. Care of gasoline torches and furnaces include the oiling of the pump at regular intervals to keep the pump leather soft and pliable and flushing out the generator from time to time to keep it from clogging. If the pump piston tends to rise and will not stay down, replace the valve at the bottom of the pump cylinder. An enlarged generator orifice requires the replacement of the orifice block. Keep a small stock of replacement parts on hand so that defective torches can be repaired without delay.

Q. When using a cable spinner for suspending aerial cable from messenger strands how is the cable protected from contact with irregular places in the strand such as strand connectors and clamps at splicing points?

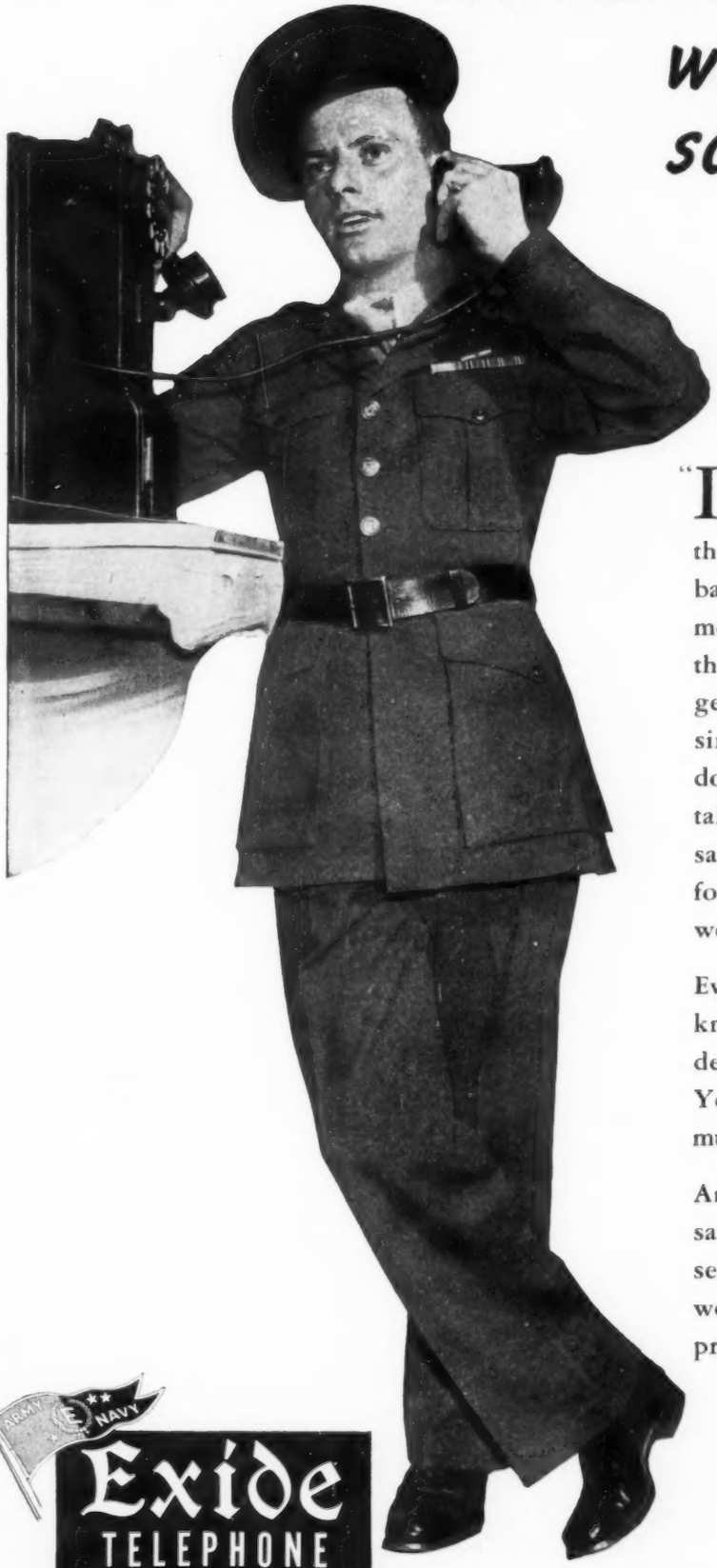
A. Cable sheath is protected from possible punctures or sharp bends at irregularities in messenger strand by means of lead shields wrapped around the cable at the splicing points. This method is illustrated in Figure 1.

Q. When using parallel drop wire to connect an open wire lead to a subscriber's residence, we have to remove about two feet of the braid from the line end of the drop in order to connect the conductors to the line wires. How should we protect the exposed rubber insulation from deterioration?

A. Taping the exposed conductors with friction tape provides simple and satisfactory protection for the rubber insulation. The method is to start wrapping each conductor near the splice to the line wire and continue down to the braid covering, overlapping the latter an inch or so to prevent moisture from working inside the braid at this point. We have found this method to be surprisingly effective in preventing lowered leakage resistance due to deterioration of the rubber insulation which sometimes causes poor ringing, especially in wet weather. Also, erratic dialing on 48-volt automatic rural lines has been eliminated by the foregoing method.

Figure 1—Illustrating method of protecting cable from contact with strand connector when cable is suspended by the cable spinner method.

NINETEEN BUCKS
worth of scuttlebutt



"I'M EIGHTEEN. But, as a Marine, I've seen life and death. And what was the first thing I wanted when we got back? Just one thing . . . to talk to my mother. I waited in that line, right over there, for three hours before they could get a call through. But, they did it! Yes sir. Good old Mom. I only had enough dough to pay for three minutes but she talked 19 bucks worth of scuttlebutt . . . said she'd pay for the overtime. I paid for it several weeks later . . . sure, it was worth it . . . just to talk to her."

Every civilian and every Serviceman knows and respects the faithfulness and dependability of the telephone tradition. You of the telephone service have done much to keep high the morale of the nation.

And in Exide Batteries you will find the same dependability for which telephone service, itself, is famous throughout the world. Since 1895, Exides have been proving themselves worthy of that trust.

ARMY E NAVY

Exide
TELEPHONE BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

Telephone Traffic Definitions

(Conclusion)

By CONSTANT F.J. BOEHLEN
Traffic Engineer, Federal Telephone & Radio Corporation

4. *Illustration of the Different Traffic Intensity Definitions*

IN PARAGRAPH 2-g, four possible definitions were given for the traffic intensity. Although these four definitions are essentially the same, each one points to a different aspect of the traffic intensity. Each definition will be illustrated by the solution of the following problem:

Assume a total number of 120 calls, during a period of two hours, with a constant holding time of 180 seconds = .05 hours per call. What is the traffic intensity?

Definition A—Traffic per Time Unit

Traffic during 2 hours = 120 x .05 = 6 hours

Traffic Intensity y = Traffic per Hour = 6 ÷ 2 = 3 Y

Or, by way of equation (2):

Call Intensity c = Calls per Hour = 120 ÷ 2 = 60 C/h

Traffic Intensity y = c x t = 60 x .05 = 3 Y

Definition B—Average Number of Simultaneously Engaged Paths

The traffic fluctuates, i.e., the number of paths, simultaneously engaged, changes continuously. Take t_0 as the total time during which no path is engaged, t_1 total time during which 1 path is engaged, t_2 total time during which 2 paths are engaged, etc., and

$$T = t_0 + t_1 + t_2 + t_3 + \ldots\ldots$$

If the times t_x are multiplied by the corresponding number of simultaneously engaged paths x and the sum of all these products xt_x is established, obviously the total engagement time, i.e. total traffic, is obtained. If this figure is divided by the total time period T, the result will be the traffic per time unit or the traffic intensity according to definition A.

Mathematically, the above development is represented as follows:

$$\frac{1}{T} \sum_{x=0}^{x=00} xt_x = y \qquad (3)$$

If a large number of observations on the number of simultaneously engaged paths is made, n_0 cases with no paths engaged will be found, n_1 cases with 1 path engaged, n_2 with 2 paths engaged, etc.

If the number of observations is large, the number of cases n_x will be almost proportional to the time t_x, or mathematically, the following equation will be fulfilled:

$$\frac{N}{T} = \frac{n_0}{t_0} = \frac{n_1}{t_1} = \frac{n_2}{t_2} = \frac{n_3}{t_3} = \ldots\ldots (\lim N \to 00)$$

wherein

$$N = n_0 + n_1 + n_2 + \ldots\ldots$$

and therefore the average number of simultaneously engaged paths will be equal to equation (3) which is the traffic intensity:

$$\frac{1}{N} \sum_{x=0}^{x=00} x\, n_x = \frac{1}{T} \sum_{x=0}^{x=00} x\, t_x = y \qquad (4)$$

Table I is an assumed observation summary of these factors, referring to the numerical example. The figures of columns 2 and 3 will be used to fill in equation (3); the figures of columns (4) and (5) to fill in the first part of equation (4). In other words, columns (2) and (3) have to prove that the traffic intensity of this experiment was really 3Y, which is what the figures of column (4) and (5), obtained by observation of the paths simultaneously engaged, have still to show to illustrate definition B.

x = Number of simultaneously engaged paths (Column 1). In this example no cases with more than 10 paths engaged were recorded.

t_x = Time, in hours, during which x paths are simultaneously engaged (Column 2). These times are assumed obtained from an automatic time recording device. The plurality of these times is the sum of several smaller time periods during which x paths were engaged. The sum of column 2 is, of course, the total time period of two hours.

xt_x = Product of columns 1 and 2, i.e. traffic in hours for each of the "x" conditions (Column 3). The total of column 3 is the traffic during the 2 hours. According to equation (3) the traffic intensity is y = ½ x 6 = 3 Y.

nx = Number of cases for which x

TABLE 1

1	2	3	4	5
x	t_x	xt_x	n_x	xn_x
0	.099	.000	4	0
1	.298	.298	16	16
2	.447	.894	22	44
3	.450	1.350	25	75
4	.336	1.344	17	68
5	.203	1.015	10	50
6	.101	.606	4	24
7	.043	.301	1	7
8	.016	.128	0	0
9	.006	.054	1	9
10	.001	.010	0	0
Total	2.000	6.000	100	293

simultaneously engaged paths were observed (Column 4). A total of 100 observations were assumed, i.e. in average, one observation every $7200 \div 100 = 72$ seconds. These observations ought not to be equidistant, but can be distributed at random over the two hours. The observer "missed" the condition of $x = 8$ and $x = 10$.

xn_x = Product of columns 1 and 4 (Column 5). The traffic intensity y is equal to the average number of paths simultaneously engaged, i.e. the total of column 5 divided by the total of column 4, or, according to the first part of equation (4) $y = \frac{1}{100} \times 293 = 2.93\ Y$. This result shows an error of about 2.3%; smaller errors would be more likely if the number of observations were increased to 1,000 or 10,000. Though it is possible to obtain a correct result with a relatively small number of observations, a correct result is only certain for an infinite number of observations.

Definition C—Average Number of Calls during Holding Time

Total number of calls during 2 hours = 120 C.

These calls are originated during a time period of 2 hours = 2 x 3600 = 7200 seconds.

Thus:

Average number of calls originated during a holding time period of 180 seconds, which is the traffic intensity,

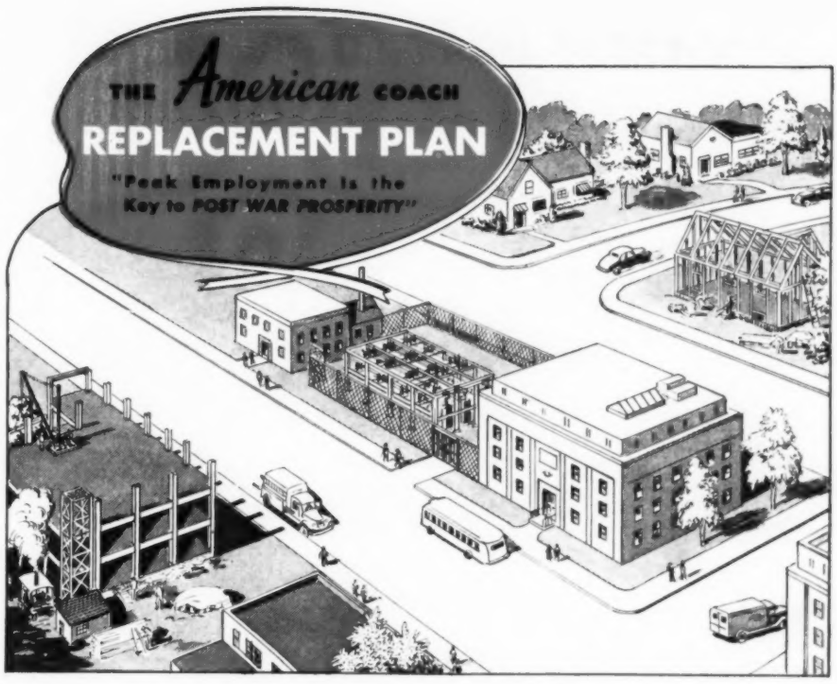
$$y = 120 \times \frac{180}{7200} = 3\ Y$$

Definition D—Minimum Number of Paths

If we place one call after the other, in such a way that a new call starts immediately when one call terminates, then one path carries $7200 \div 180 = 40$ calls during two hours. The total number of calls originated during these two hours is 120 and therefore the minimum number of paths required to handle the traffic is $120 \div 40 = 3\ Y$, which is again the traffic intensity.

Calls crossing the limit lines of the observation or traffic period may cause some uncertainty in the application of the definitions. Such calls contribute only for a part of their holding time to the traffic of the period before a limit line; beyond the limit line they increase the traffic without appearing as calls, originated during the next period. However, it may be assumed

(Please turn to page 53)



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Present Equipment, greatly depleted by the tremendous strain placed upon it by the extra-heavy war needs, will be inadequate to meet the demands for the installation of the many miles of new power and communication lines that will be required to service the thousands of new projects (homes, factories, etc.) envisioned for the post-war period. • It is estimated that at least 20% of all utility trucks will have to be replaced immediately after "V" Day, and that many additional trucks and much new equipment will be needed quickly. • A large number of these trucks will need "American Coach" Utility Bodies and Equipment.

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PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

Electrical Fundamentals For the Telephone Man

(Continued from page 31)

which make the apparent resistance larger than the ohmic resistance, hence to determine the actual effective resistance, as it is called, of an A.C. circuit an impedance bridge must be used. The circuit of popular type of impedance bridge capable of measuring capacity, inductance, and ohmic resistance is shown in Figure 59.

Cathode Ray Oscillographs

FOR examination of alternating current wave form cathode ray oscillographs are widely used. These instruments permit an alternating current wave to be thrown on a fluorescent screen and the characteristic measured and examined.

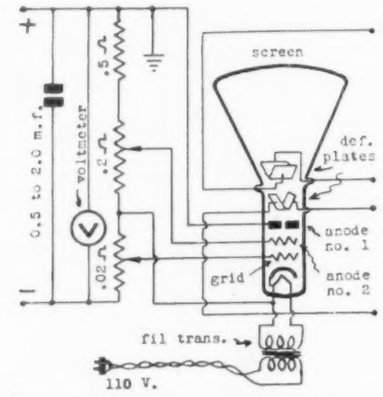

Fig. 60. Basic circuit of cathode ray oscillograph tube

The Cathode Ray Oscillograph is an old invention but it is only in recent years that it has become a practical and really useful piece of laboratory equipment.

Basic Principle of Oscillograph

THE principle of the Cathode Ray Oscillograph is quite simple.

A complete Cathode Ray Oscillograph which will permit viewing waves of different frequencies consists of three essential units, viz: The Cathode ray tube, the sweep circuit, and the power supply unit.

The Cathode ray tube consists of an evacuated glass tube as shown schematically in Figure 60, having a heater filament, cathode, a grid, and two anodes and two sets of electrostatic deflecting plates.

The theory of operation is as follows: The cathode when heated throws off negative electrons in the same manner as any vacuum tube. These negative electrons are attracted toward the anodes by the high positive voltage connected to this element. In traveling to the anode the electrons attain quite high velocity. Some of the electrons strike the hole in the center of the anode and because of their high velocity continue on toward the end of the tube where they strike the glass. The grid and anode Number 2 serve to focus the beam into a concentrated stream of electrons.

The inside surface of the end of the Cathode ray tube is coated with certain chemicals, such as zinc orthosilicate and calcium tungstate, and gives off a brilliant greenish glow at the point the electrons strike this "fluorescent" material.

Now if a positive potential be applied to one of the deflecting plates and a negative potential to the other, the beam of electrons traveling toward the end of the tube will be attracted toward the positive deflecting plate and repelled from the negative plate as shown in Figure 60 - 1.

A similar effect would be observed by placing a magnet in a position such that the north pole is on one side of the tube and the south pole on the other.

The amount of deflection of the electron beam is determined by the magnitude of the electro-static or electro-magnetic fields.

It should be apparent from the foregoing description of the action in a Cathode ray tube that the electron beam is an electronic pointer without mass and acting almost at the speed of light. We can use this electronic pointer to trace out on the fluorescent screen any wave form regardless of frequency.

Cathode Ray Sweep Circuit

IN order to be able to actually see the shape of an A.C. wave on the cathode ray screen, an electronic time axis must be established. This is accomplished by means of a sweep circuit. The sweep circuit consists essentially of a D.C. power source which charges a condenser of adjustable value through a high resistance. The condenser is connected across the plate circuit of a grid glow (gaseous) discharge tube. When the voltage on the condenser reaches the critical or breakdown value for the tube, the gas ionizes which discharges the condenser almost instantly and the tube then deionizes and the condenser again starts charging. The frequency of this action depends on the value of capacity cut in and the grid control voltage on the gaseous tube. By varying the capacity and grid voltage, any desired frequency can be obtained. The wave form of the sweep circuit should have a saw tooth shape as shown in Figure 61 - 1.

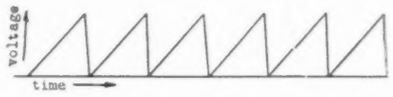

Fig. 61-1. Wave form of sweep circuit

The slow rise and rapid decrease in voltage occurring across the sweep condenser is impressed across the second set (horizontal) or electrostatic deflecting plates of the Cathode ray tube and cause the electron beam

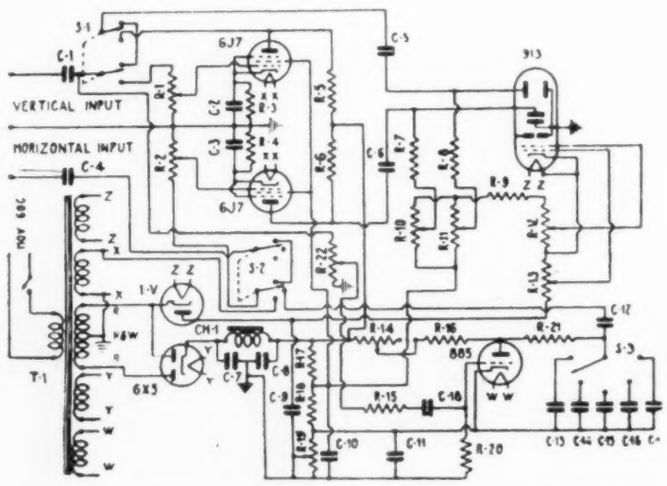

Fig. 61. Schematic of cathode ray tube and associated sweep circuit

to travel horizontally over the fluorescent screen at a uniform rate in one direction and to return at a much faster rate in the other direction.

If the speed at which the sweep circuit operates is adjusted to the same frequency as the source whose wave form is to be analyzed, then a single wave of the source connected to the input plates will appear on the fluorescent screen.

Cathode Ray tubes are made in a variety of sizes and types. Some require anode voltages of as high as several thousand volts, while others can be operated on anode voltages as low as 300 volts.

Figure 62 illustrates how the Cathode Ray beam will trace patterns on the fluorescent screen under different conditions.

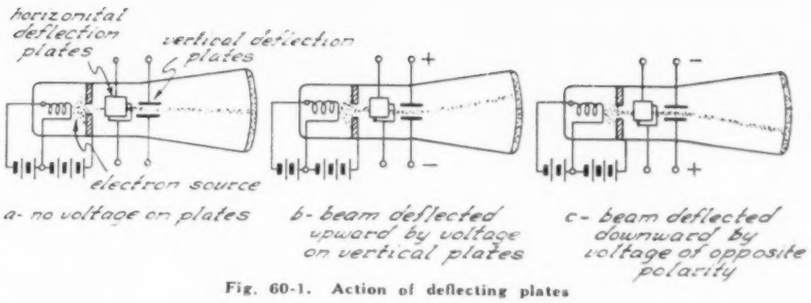
horizontal deflection plates
vertical deflection plates
electron source
a- no voltage on plates
b- beam deflected upward by voltage on vertical plates
c- beam deflected downward by voltage of opposite polarity

Fig. 60-1. Action of deflecting plates

Kinds of A.C. Measurements

A.C. current and voltage measurements cannot be included under one general head as can direct current measurements due to the fact that different types of instruments are required for different frequenty ranges. The following tabulation shows the type of instrument suitable for the various frequency ranges.

Frequency

Range (cycles)	Type of Instrument
0 - 133	Soft iron vane type Copper oxide Thermo couple
133 - 10,000	Copper oxide Thermo couple Vacuum type voltmeter
Above 10,000	Thermo couple Vacuum type voltmeter

In making measurements on A.C. circuits the effect of the meter impedance on the source under measurement must be taken into account. For example, assume we wish to measure the output voltage of say a 20 cycle ringing machine such as is used in the telephone field. If the 20 cycle source has a fairly high impedance (as is usually the case) we must use a high impedance meter so that the current drawn from the source will be small, otherwise an excessive voltage drop will take place in the source due to current taken by the meter; hence the meter would show a much lower voltage than the normal open circuit voltage of the source.

In measuring voltages and currents of commercial power sources, low impedance meters can be used as the source if impedance is very low. In making measurements on voice frequency sources such as telephone lines, public address systems, etc., the source impedance is usually relatively high, hence high impedance meters should be used. Radio frequency circuits are usually of the high impedance type requiring high impedance instruments.

The soft iron vane type A.C. instruments are classified as low impedance

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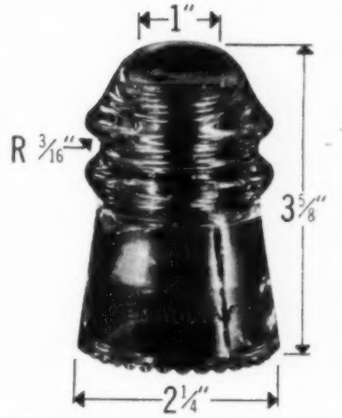

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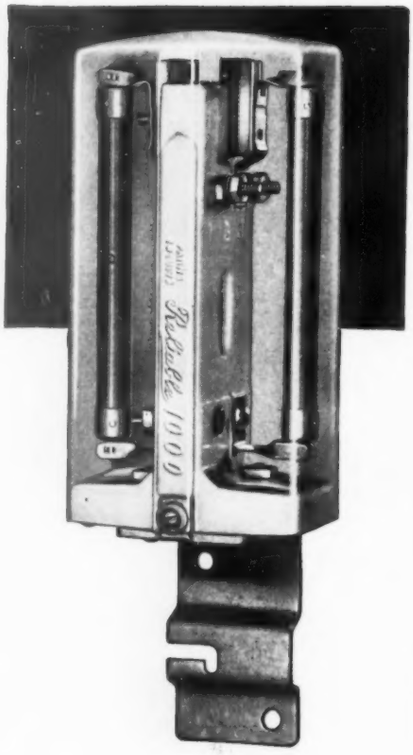

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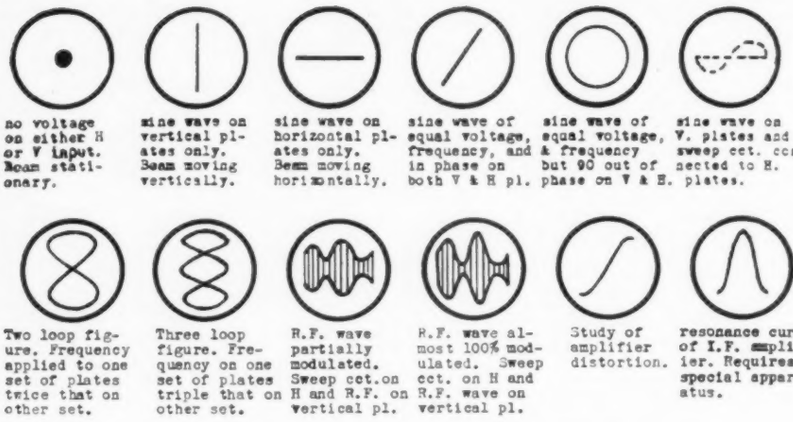

no voltage on either H or V input. Beam stationary.

sine wave on vertical plates only. Beam moving vertically.

sine wave on horizontal plates only. Beam moving horizontally.

sine wave of equal voltage, frequency, and in phase on both V & H pl.

sine wave of equal voltage, & frequency but 90 out of phase on V & H. plates.

sine wave on V. plates and sweep cct. connected to H. plates.

Two loop figure. Frequency applied to one set of plates twice that on other set.

Three loop figure. Frequency on one set of plates triple that on other set.

R.F. wave partially modulated. Sweep cct.on H and R.F. on vertical pl.

R.F. wave almost 100% modulated. Sweep cct. on H and R.F. wave on vertical pl.

Study of amplifier distortion.

resonance curve of I.F. amplifier. Requires special apparatus.

Fig. 62. Cathode ray oscillograph patterns

meters as they seldom run over 100 ohms per volt. Copper oxide meters are available with impedances as high as 2000 ohms per volt, hence are useful on high impedance circuits. Thermo-couple instruments are considered as low impedance instruments; however, because of their ability to measure alternating current of any frequency they are used as current measuring units as their low impedance permits them to be inserted directly in the line. They are used chiefly at radio frequencies.

For potential measurements on high impedance A.C. sources of any frequency and where it is desired that the measuring instrument draws virtually no current from the source under measurement, the vacuum tube voltmeter should be used. The vacuum tube voltmeter has almost infinite input impedance, hence voltage readings obtained represent the true open circuit voltage of the source under measurement, whereas with the other types of instruments mentioned, the readings obtained represent the true open circuit voltage less the voltage drop in the source under measurement due to current taken by the instrument.

(Questions Below)

Oklahoma Exchange To Close

The telephone exchange at Quinlan, Okla., owned by Elie Chastel was authorized by the Oklahoma Corporation Commission Feb. 19 to close the exchange and abandon service on April 1. Man power shortage and insufficient revenues were the main reasons for the abandonment. It is reported that the Oklahoma Commission through its telephone engineer had tried to get a purchaser or lessee to take over the property with no success. A number of Oklahoma exchanges are facing the same situation and it is expected that a number of additional abandonment applications might follow.

EXAMINATION NO. 10

A.C. Testing Instruments

1—Why should D.C. instruments not be used on A.C. circuits?

2—Explain the operation of the soft iron vane type instrument.

3—Explain the theory of the thermo-couple A.C. movement.

4—Can a thermo-couple type ammeter be used to measure current at a frequency of 1,000,000 cycles?

5—Describe the operation of the rectifier type movement.

6—Which has the greater sensitivity, the soft iron vane type or the rectifier type movement?

7—What is the principal advantage of the vacuum tube voltmeter over other types of A.C. voltimeters?

8—What is the basic difference between a wattmeter and a kilowatt hour meter?

9—Explain briefly the operation of the cathode ray oscillograph.

10—What is the purpose of the sweep circuit in a cathode ray oscillograph?

Telephone Traffic Definitions

(Continued from page 49)

that on the average the traffic gain caused by calls extending from the preceding period compensates for the loss of traffic from the calls extending beyond the end limit line. The error will then be negligible, provided the holding time is short as compared to the traffic period, and the number of calls is relatively large.

5. Conclusions

DEFINITIONS and units are given for the various traffic concepts. The nature of the traffic intensity concept is particularly exemplified. It is shown that the busy hour is a well determined period and is not a different one for each day; furthermore, that traffic and traffic intensity, as well as calls and call intensity, are different concepts and should not be confounded.

Indiana Commission Grants Increase In Rates

The Public Service Commission of Indiana has approved an increase in the rates of the United Telephone Co., of Warsaw, Ind., which operates 72 exchanges and serves approximately 30,000 subscribers. The increase amounts to about 25c per station per month. During extensive hearings held by the Commission the Office of Price Administration objected to the company's application claiming that an increase would be inflationary. The Commission pointed out in its written opinion, however, that the added revenue would be entirely used up in meeting increases in wages, granted "by the same federal government which seeks to prevent a rate increase" and that "the Commission could not fairly hold to the opinion that the company's request for increased rates should be denied simply because such increase may be a factor in an inflationary spiral." The Commission at the same time expressed the belief that an increase would not contribute noticeably to inflation.

The Commission stated that the rates had not been changed for 15 years and that in addition to providing needed revenue the proposed increases would produce desired uniformity. A "current fair cash value" of $03,50,000 was established by the regulating body as a rate base upon which it was estimated a fair return of 5½% would be earned. The Commission's engineer testified that the original cost of the property, without deduction for depreciation, was $4,251,836, while the company's engineer testified to a figure of $4,604,473.

The Commission also rejected the OPA's contention that increased federal taxes should not be allowed as operating expenses. Such taxes, the Commission said, "are legally deductible for rate-making purposes as an expense of operation." The Commission stated that the company had never paid an excess profits tax.

According to the Commission's report, President Lucier of the company testified that although increases in compensation under new Bell contracts would produce additional revenues of approximately 90c a station or a total of $27,000, the net increase would be only $11,600. He stated that part of the amount to be paid the company was to reimburse it for losses resulting from adjustments made in overtime rates and elimination of report charges, that there would be losses on the line haul, and that the company would be obliged to split increased commissions with its own connecting companies.

Among items which the Lend-Lease Administration reported recently as having been sent to Russia were 14,000 field telephones and hundreds of thousands of miles of field telephone wire.

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Send for folder and prices of this labor saving equipment.
SEYMOUR SMITH & SON, Inc.
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Locating Trouble on Rural Lines

(Continued from page 33)

will give a general measure of the distance to the fault.

Figures 6 (a), (b), (c) show the methods utilized in testing for an open, a cross, and a ground, respectively.

If the resistance of the fault does not exceed 600 ohms, the test lamp in the set may be employed to judge the distance to the fault by the degree of its brilliancy by operating the lever key to the proper position and turning the generator crank.

Figure 7 shows how the test set may be made use of for checking splices in line wire for high resistance connection. The shunting lead should be of as low a resistance as practicable (at least .1 ohm).

To check the set for correct operation, a non-inductive resistance of 660 ohms should be connected to the line leads with the fault finder coil clamped over one of the leads. A faint tone should be heard in the receiver when the generator crank is turned while listening in the receiver. Shorting together the line clips should produce a loud tone.

Circuit Tests with a Portable Ohmeter

WHEN used to supplement the magneto test set, the ohmmeter is quite useful, particularly when a high resistance fault fails to actuate the finder coil of the test set. The ohmmeter finds its best use in checking trouble inside a subscriber's set. This type of instrument is in reality a voltmeter connected in series with a small flashlight cell mounted internally in the same case with the meter. The scale is calibrated in ohms so a direct reading can be obtained without the need for computing the resistance value from voltage readings as in the case of the wire chief's voltmeter. Probably the most useful type of ohmmeter is one having two scales, 0-5000 ohms and 0-50,000 ohms, the change from one scale to the other being accomplished by means of a switch. A zero-adjusting screw sets the ohmmeter needle on zero when the test leads are shorted before making tests with the meter.

When a fault has been traced to a subscriber's set, the following steps are taken to check the set which is of the magneto type. The ohmmeter is first connected across the line terminals.

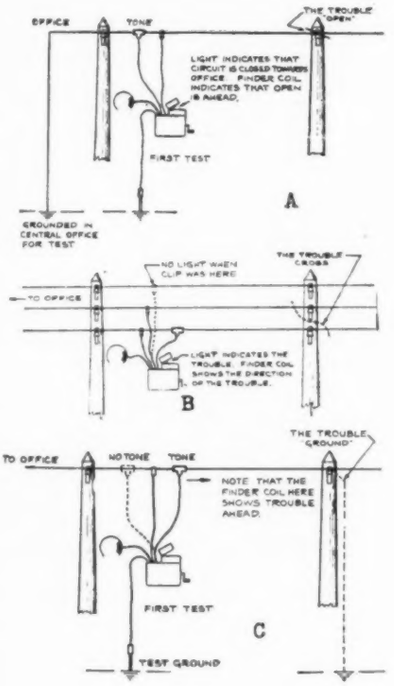


Fig. 6—How the Magneto Test Set is Used for Locating Line Faults. (a) Method of Testing for an Open in the Line Wire. (b) Method of Testing for a Cross. (c) Method of Testing for a Ground.

If there is no condenser in the ringer circuit, the meter will read the resistance of the bells alone. A resistance much lower than this value indicates a fault in the set. If no condenser is in the receiver circuit, and the switchhook fails to break the receiver circuit with the receiver on the hook, a low reading will be obtained.

If the operating switch of the generator sticks, leaving the winding across the line, the meter will read approximately the generator resistance. Carbonized insulation in the generator shunt spring assembly may short-circuit the generator and result in a low resistance reading.

A resistance much higher than the rated resistance of the ringer indicates a fault in the ringer circuit. Measuring the ringer resistance will indicate whether the fault is in the ringer coils or in the connection between the line terminals and the ringer.

Trouble apparently due to poor connection or higher resistance than normal can be checked by watching the

action of the ohmmeter needle while moving the wires and the various parts of the subset such as the switchhook springs, generator springs and the receiver cord. If the affected part is touched, the meter needle will fluctuate.

If the telephone set shows no defect on this test, the operation of the generator switch should be checked by turning the crank handle sufficiently to operate the switch mechanism. The ohmmeter reading should drop to between 200 and 350 ohms. If the generator is open, no change in the reading will be observed; but if it is shorted, the meter will read a low value corresponding to the degree of short.

The ohmmeter should be connected to the receiver terminals, which should result in a reading of 75 to 100 ohms. A higher resistance indicates the winding may have gone high, while a lower resistance value shows the possibility of a shorted coil. If a condenser is present in the receiver circuit, it should also be tested. No reading or only a slight kick on the high resistance scale will indicate the condenser to be satisfactory.

When testing the primary circuit of the telephone, the battery in the circuit should be removed to prevent possible damage to the ohmmeter by passing current from the battery through the meter inadvertently.

Conclusion

THIS article would be incomplete without a mention of the method used in up-to-date telephone offices for checking trouble when it is first reported and keeping track of the steps taken to clear the trouble until completion of the job.

The simplest form that can be used for this purpose is the **trouble ticket.** Figure 8 illustrates the form used by many telephone companies with successful results. The use of the ticket prevents the possibility of either the wire chief or the operator forgetting to handle any case of trouble brought to their attention.

When a case of trouble on a line is reported to the operator, she makes out a trouble ticket and passes it on to the wire chief for his attention. The wire chief at once proceeds to test the line reported in trouble and records the nature of the trouble found on the ticket, together with its probable location if this can be determined with some degree of accuracy. A trouble man is then dispatched to locate the fault and clear it. When this is done, the trouble man reports back to the operator that the fault is now cleared and the line back in normal service.

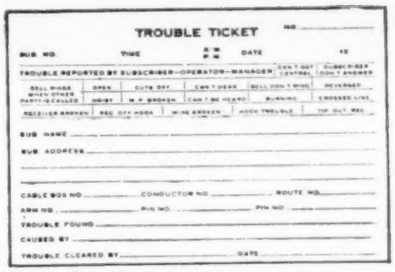
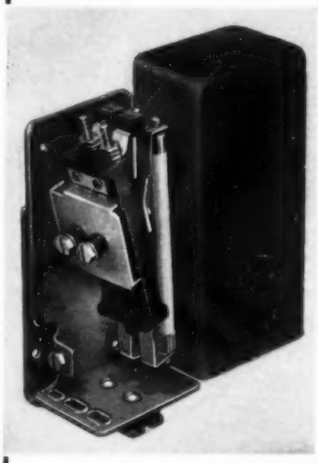

TROUBLE TICKET

Fig. 8—Trouble Ticket form Suitable for the Average Exchange.

At the time the operator makes out the trouble ticket, she records the time the trouble was reported, the nature of the complaint, and the telephone number of the line in trouble on a complaint record. When the troubleman reports that the fault has been cleared, she records this fact on the same form, giving the time the trouble was okayed, the nature of the trouble found, its classification, and the name of the troubleman.

A telephone company that has set up an efficient system of recording complaints of line trouble and that is blessed with an alert group of employees who take pride in keeping exchange lines free from trouble, enjoys

COOK SUB-STATION PROTECTORS



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The Type **RO** (as illustrated), is for outside mounting and is equipped with a bracket and heavy zinc weather hood. The heavy steel bracket will appeal to those telephone engineers and maintenance men who want equipment that can take quick, rough handling and subscriber abuse without danger of breakage.

The Type **R** Sub-Station Protector Mounting has a higher resistance to breakage from the shocks of severe electrical discharges. They are equipped with heavy studs for connecting drop wires and ground. All structural parts, and the heavy hood and bracket of the Type **RO** are grounded.

The Type **RI** (without hood), is for inside mounting.

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Harrell Elected President of New England Company

Joe E. Harrell, vice president in charge of public relations of the New England Telephone and Telegraph Company, has been elected president of that company. He succeeds John J. Robinson, who reaches retirement age on March 1 after nearly 45 years in the Bell System.

Mr. Harrell has had wide Bell System experience in the public relations and operating departments. He started as an apprentice in Long Lines Traffic at Atlanta in 1913. After holding various traffic positions in several major cities, he joined the New England company in 1925, as general toll traffic supervisor. Since then he has served successively as division traffic superintendent, general traffic supervisor, general traffic manager, general commercial manager, assistant to the president, and vice president and director.

Bartlett T. Miller, general commercial manager, succeeds Mr. Harrell as vice president.

NARUC Cooperating Committee Meets In Chicago

THE joint meeting of the National Association of Railway and Utility Commissioners (NARUC) with the Federal Communications Commission on telephone regulatory problems and its subcommittee of staff experts met in Chicago March 6 to discuss progress reports on the Bell System license contracts costs which have been the subject of extensive field studies by the FCC staff during the past year. Three reports of the FCC were discussed during the meeting which continued through March 7 and 8. FCC commissioners Walker and Wakefield together with M. K. Toeppen and Lewis Hayner represented the FCC. The NARUC representation included Fred Hamley, Commissioners Leon Jourolman of Tennessee, Ed McNaughton, California, A. B. Rudd, Jr. Va., Wayne Limbocker, Kans., F. A. Loftis, Pa., Ben Blanton, Mo., Paul E. Reed, Ohio and Paul Reed of Okla. Also present were Ray Weems of Okla., Richard Sachse of Calif., Frank Morgal, Pa., Major Herbert J. Flagg, chief engineer of the N. J. Commission, chairman John Siggins of Pa. and Malcolm Orton, chief engineer of the N. Y. Commission.

The joint committee reviewed the license costs and license revenues of the American Tel. & Tel. Company analyzing how the various departmental costs are allocated to license and non-license accounts. They also analyzed the formula by which the license costs are allocated to the various associated companies of the Bell System.

The joint committee was assisted in their discussions by the FCC reports mentioned above. The first is a memo of the discussion of the Securities Exchange Commission bearing on section 13 of the SEC Act—the section bearing on the validity of service charges by service companies. The second was the FCC report on license contracts and license costs of the Bell System and the third was in regard to the costs and expenses of the Bell Laboratories. The meeting ran until Wednesday noon, March 8.

Although the meeting was a closed one we understand there were no conclusions reached or principals adopted. The Staff Committee will prepare a report of the discussions to be sent to the Commissioners Committee with the idea that it will be used in future conferences with officials of the American Tel. & Tel. Company possibly within the next 30 to 60 days.

12 Reasons WHY LEADING TELEPHONE COMPANIES STANDARDIZE ON

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P&H PENTA POLES

FULL LENGTH TREATED NORTHERN WHITE CEDAR

No. 3 . . . P & H Penta Treatment was developed and tested in the Laboratory — Proven in the field.

Watch for Reason No. 4

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"STILL IN THE LEAD"

MEET THE AXEES
The Gremlins of Accidents

Axees aren't at all angelic,
And that includes this smarty, Elec.
He plays tricks with loose connections,
Frayed lamp cords and your neglections.
Watch him; you can't hear him knocking;
Keep him out—his conduct's shocking!

NATIONAL SAFETY COUNCIL

25 YEARS AGO THIS MONTH

Taken from TELEPHONE ENGINEER files of March, 1919.

Twenty-five years ago TELEPHONE ENGINEER AND MANAGEMENT carried an article written by Douglas C. McMurtrie, director Red Cross Institute for Crippled and Disabled Men. It was a most timely article then and because the Red Cross drive is on this month it is just as interesting now. We hope our readers will remember we have many disabled boys returning again from the battle fronts and the Red Cross is deserving of our support.

★

The Georgia State Association of Independent Telephone Companies was organized in Atlanta twenty-five years ago with R. L. Stewart elected president and W. M. Brown elected secretary and treasurer.

★

Twenty-five years ago a conversation between parties at Butte, Montana and Atlanta, Ga. was considered an almost physical impossibility. However, the feat was accomplished with the telegraph clearing the lines. For instance, the operator at Atlanta would transmit a message by telegraph to the next station equipped with a repeater, saying that a party at Atlanta is calling a party at Butte. This telegram was continued along the route until the lines were cleared, all connections effected and the two parties were ready to talk.

★

Postmaster General Burleson said that hotels, clubs and restaurants that persist in charging ten cents for local telephone calls would soon find themselves telephoneless. It seems history repeats itself in many ways.

★

Twenty-five years ago the Pennsylvania Railroad Company had in mind the installing of a telephone system for the operating of trains, however, the project was temporarily abandoned because of the war. Today, the Pennsylvania Railroad is again making advances, and are planning to operate its trains by means of radio telephone.

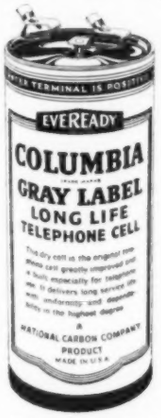
Telephone Service to Trinidad Opens

Another West Indies neighbor was brought into closer contact with the United States February 23 when radio telephone service was opened between this country and the British island possession of Trinidad. To inaugurate the opening, Lord Halifax, British Ambassador to the United States, exchanged greetings from Washington with Sir Bede Clifford, Governor of Trinidad, at Port-of-Spain.

Service to Trinidad is handled through the short wave radio telephone facilities of the American Telephone and Telegraph Company centered at Miami. The Trinidad Consolidated Telephones, Ltd. operates the service in Trinidad, employing the radio stations of Cable and Wireless Ltd. The rate for a three-minute call between the southeastern section of the United States and Trinidad is $12.

Trinidad, the most southerly island of the West Indies, is a stop on the direct air route from this country to Brazil. Both import and export trade is largely with the United States, and the chief products are asphalt, oil and their derivatives.

"Eveready" • "Columbia" • "Gray Label"



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- Longer life.
- Rock-bottom economy.
- Developed in America's largest dry battery laboratory.
- Made by the makers of "Eveready" "Air Cell" Operators' Transmitter Batteries.

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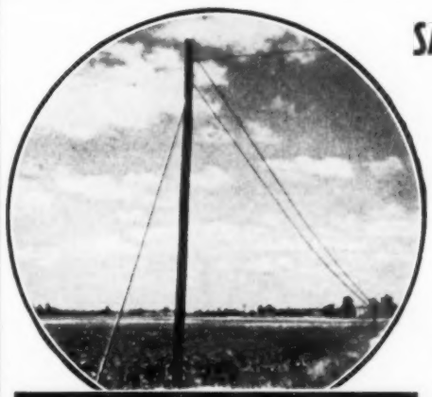

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CONSERVE MATERIALS!

NOW — more than ever — time and material are of vital importance. You conserve both when you specify **Crapo** High-Tensile Line Wire for essential new construction and for necessary replacement.

Longer, stronger spans, made possible by these high-strength wires, reduce the number of pole structures, conserve materials, and save man-hours both in building and in maintenance.

Crapo HTL-85 permits spans of 225 feet in heavy loading districts; provides stronger, safer spans on existing lines.

Crapo HTL-135 makes practicable spans of 350 feet in heavy loading, 500 feet in light loading areas. Both are superior to standard B.B. wire in transmission qualities.

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LETTERS

(Continued from Page 18)

(Continued from page 18)

any of the pictures; however, our censor here is exceptionally strict, and I am inclined to believe him when he says whenever he passes anything it is O.K. Am enclosing more just in case you are interested.

Was unfortunate to have to spend a couple weeks in the hospital, including Thanksgiving. Nothing serious, but can't at this time tell you what it was—more censorship regulations.

My Signal Officer jeep.

These scenes are typical.

Speaking of PX's and Parker 51 Pens—well, the three million they are retailing must all be in the States, as no one has ever seen one for sale in this Theatre. The amount of articles we have here are very limited, but maybe one of these days one will turn up.

The name of the chap with me in the picture is 1st Lt. Arthur J. Isaac, Jr., and a mighty fine boy.

I have written a short article about some assault wire and some other telephone material which I think will be of interest to you. But it has to clear through our G-2 first, and that always takes a week or ten days; so, will have to wait until he releases it before I can send it on.

I sincerely hope you had a most happy Holiday Season and that 1944 will bring you continued success and lots of happiness.

My very best and most heartfelt wishes to you and all . . . and please remember me to every one.

Sincerely yours,
George S. Blake
Captain Sig C
Signal Officer

◆

The Editor:

I thank you for the January BLUE BOOK copy of your periodical which I have passed on to Mr. A. D. Hodgson, Director Telecommunications Department, of this city.

The Electricity Department (of which I have charge) and the Telegraph and Telephone Department were originally merged but have been separated for a number of years now.

If your magazine has a counterpart on the electricity supply side I shall be most grateful if you can arrange to enter me as a subscriber.

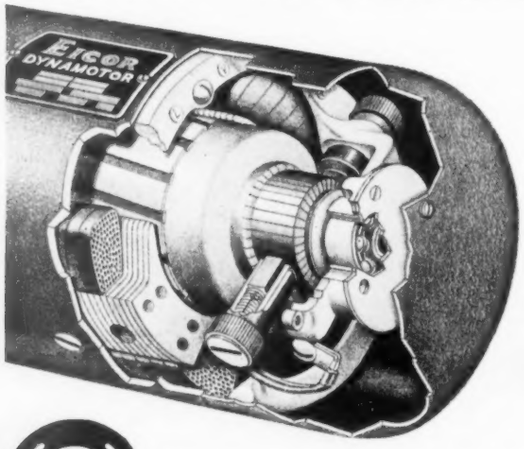
Yours faithfully,
Office of Director
Electrical Department
Nassau, Bahamas

◆

Dear Ray:

I like your magazine. Your Question & Answer department is good—in fact they answer my questions about 30 days before I can think of them.

Sincerely,
D. O. White,
Thomas Telephone Co.
P.O. Tampico, Ill.



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EICOR produces a Dynamotor for *every* need—from the smallest in size to the largest in output. Our complete line of frame sizes makes possible the greatest available range of dynamotor output ratings, sizes and weights.

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China Maps 10-Year Plan In Expanding Telephone Networks

A MOST significant report on the communications plans of the Chinese Government and its Ministry of Communications with an extensive 10-year project for the expansion of telephone service in China has been transmitted to the State Department by Omar C. Bagwell of New York, for many years a representative in Spain of the International Telephone & Telegraph Corp. who during the past year has served in China as a specialist in telecommunications under the State Department. Mr. Bagwell, whose return to the United States was announced by the State Department Feb. 18, was one of 21 specialists made available to the Chinese Government by the State Deparement to assist that Government in its prosecution of the war.

In his report, it was understood that Mr. Bagwell, besides giving his views on the Chinese domestic telephone requirements, discussed the direct radiotelephone circuit from the United States to Chungking which is now in the process of being established. It is hoped this circuit will be commenced within four or five months after a 20 KW transmitter is installed in China.

In regard to the long distance telephone system of China, Mr. Bagwell reported that the inter-city links were at present monopolized by the Chinese military and other Government activities so that there were no facilities over the limited cable channels for commercial and personal calls.

Mr. Bagwell's views on a 10-year telephone development program for China were said to be most interesting. It is proposed to have in China 1,000,000 additional telephones which would give a ratio of one station per 300 inhabitants instead of the proportion in the United States of 1 to 10 persons. The estimated cost of this expansion would be approximately $40,000,000, which, added to the value of the existing Chinese telephone plant of $10,000,000 would mean a grand total at the end of the decade after the war of $50,000,000.

It was proposed that the expanded Chinese system would be largely automatic. As to the production of telephone equipment, Mr. Bagwell reported to the State Department, it was said, that the Chinese Government leaders are extremely desirous of manufacturing their own equipment. However, it was felt that the United States manufacturers would have to supply some of the needed apparatus. In addition, the United States will undoubtedly have to assist in the furnishing of machinery and tools and a number of engineers to aid China in creating its own manufacturing industry.

Minnesota Company Files For New Rate Schedule

The Garvin (Minn.) Telephone Co. has filed an application with the Railroad and Warehouse Commission of Minnesota for authority to change its schedule of telephone rates at its Garvin exchange. The Commission has ordered a hearing at Garvin on March 13.

AN ATTRACTIVE
CHURCHILL
TELEPHONE BOOTH
Will INCREASE
Your Pay Station Business

The CHURCHILL No. 100 Folding Door Telephone Booth is built as a single unit and equipped with a reinforced back panel for mounting a wall telephone or coin collector. Made of selected white oak. Available in light or medium oak in a beautiful satin finish. Electric light and electric automatic ventilator are standard equipment. Booth has no floor. Overall height, 84¾"; width, 29"; depth, 30½". Shipped knocked down and crated. Write for literature about this and other CHURCHILL telephone booths.

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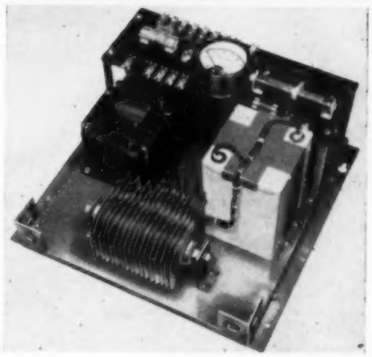
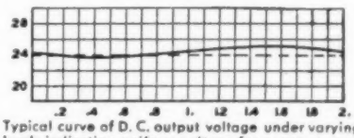
- Release charging pairs for revenue producing service.
- Minimize power costs because of high efficiency in converting A.C. to D.C.
- Improve telephone service because of stabilized voltage.
- Save $30 to $90 a year.
- Require no maintenance because they have no moving parts . . . nothing to wear out.





Typical curve of D.C. output voltage under varying loads indicating uniform voltage for proper operations of automatic telephones

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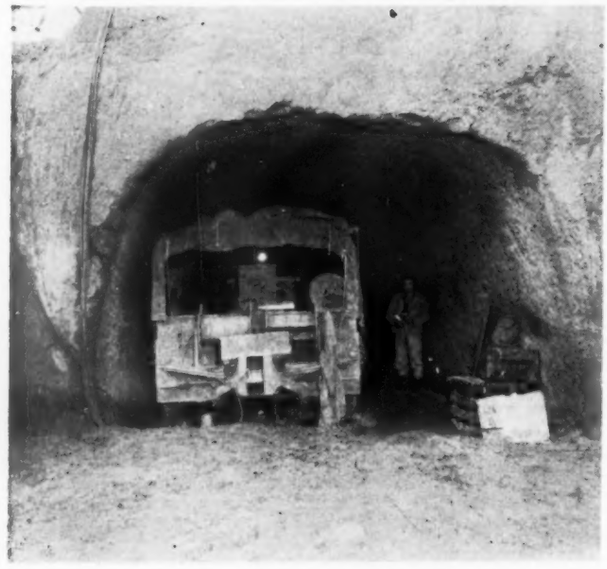


La Cave Area, Italy. American soldiers use German made caves and dugouts for the same purpose that the Germans used them when they occupied this sector.

Report of Communications On the Italian Campaign

(Continued from page 35)

cessful in that it forced the temporary withdrawal of all Allied units, except the radio team of a Signal battalion which received orders to hold on at any cost. For twenty hours this unit was the most advanced of the Fifth Army and was almost four miles ahead of all other support. At no time, during the enemy thrust, had communications been lost, although a German patrol crossed the river at one point and attempted to destroy a transmitter installation. But radio operators, maintenance men and officers, only having submachine guns, rifles and carbines, repulsed the patrol with losses. An officer reported that even though every man in the group realized the seriousness of his position, "they stuck it out" and "no one became panicky or obviously nervous". He compared the atmosphere to that of a fraternity house with everyone following the progress of a football game.

Lessons which had been preached in training classes and in communications manuals have, on occasions, proven impractical, the report to the War Department stated. At one stage of the operation, it was noted the Fifth Army's command post was located only a little more than 3,000 yards from the main line of resistance and extending rearward, in this order, were the Division Headquarters and the battalion command post. According to the training instructions this formation would be exactly in reverse.

Used Italian 23-pair Underground Cable

IT was recounted in the report that after mopping-up operations were completed in the Pontecagnano sector and Naples was captured by the Allied forces, communications were stretched into the stricken city. The collapse of resistance was so sudden and unexpected that German demolition squads had devoted little time and effort to destroying other than open-wire circuits within Naples proper—except the major damage in the mining of the central telephone exchange of that city. However, existing communications facilities were rather hopelessly damaged and tangled as a result of bombing and artillery poundings. (This description gives a picture of the possible things-to-come on the Continent.—Ed.)

As the Fifth Army advanced on through the town of Caserta, lying 18 miles north of Naples, systematic destruction of pole line routes were encountered. All open wire was completely destroyed, either by slashing, or by strapping blocks of TNT to the butts of telephone poles. What poles remained erect had been either sawn almost completely through just off the ground, or located in heavily-mined areas. One favorite trick of the enemy was to saw poles almost through along the rim of a deep canyon or on the edge of the road overlooking a deep precipice. When signalmen "hit the top" to repair circuits, one or two lines holding the pole erect would give way and topple pole and man to the ground.

The bulk of the wire communications of peacetime Italy was carried by the state-owned 23-pair underground cable linking major cities and towns on the Italian calf. The discovery of this cable and its eventual rehabilitation is a story in itself, but cannot be revealed at this time. The destruction of this cable, however, was only minor and its conversion to military use lightened the communications burden materially. None of the other civilian facilities were available to military rehabilitation because of extensive, thorough damage to repeater stations, terminal equipment, loading pots, and flooding or dynamiting of manhole positions.

During the first few weeks of the campaign there were but three wire construction teams. A fourth which would have originally worked with the Fifth Army had to be loaned to a Ranger unit because the latter relied heavily upon wire on many occasions.

The Signal Corps personnel were in the forward areas throughout the campaign and took their chances in this "Purple Heart" territory right along with the Infantry, Combat Engineers, Artillery and others.

River Crossings Dangerous

IN the Italian campaign, river crossings have proved one of the worst danger spots for Signal troops as assault forces when they had effected positions on the other side instantly needed communications to maintain contact with support and supply elements. Swollen by unusually heavy rains and frequently well covered by enemy machine gun and small arms fire, the Italian rivers have claimed the lives of many signalmen.

This report to the War Department, which was summarized initially in the Feb. 24 issue, was written by Lieutenant Edwin E. Dowell of the Signal Corps, stationed in Italy, under the direction of Colonel J. T. Tully, Deputy Chief Signal Officer with the AFHQ in Italy.

But despite the biting cold and strenuous hostile opposition, the American Army linemen have waded and swam the rivers in order to establish communications facilities. The procedure has been to tie a section of wire or cable, the latter weighing 200 pounds for each one hundred foot length, around a man's waist, bid him "Good luck" and try to cover his crossing with supporting fire. The Signal Corps swimmer has to dig in on the opposite shore most times because of the enemy fire and then set up his telephone facilities when the fire lessens.

The winter weather conditions have also

Venafro Sector, Italy. This party of airborne infantry Regt. linesmen lays field wire from hand held reels as they make their way toward a mountain command post. Mules are used to carry wire and supplies.

been a tough handicap and obstacle for the Signal Corps construction crews. With mud oozing knee-deep and congesting traffic on the narrow winding roads, it has been next to impossible to lay line from vehicles. The numbing cold at night and in the early morning hours converts the mud into a knife-edged crust. Water freezes in canteens and frost-bite and "trench-foot", a relatively new affliction peculiar to this region, are constant enemies. The lower terrain in the Italian mountain valleys are usually permanently shrouded in damp, penetrating mist.

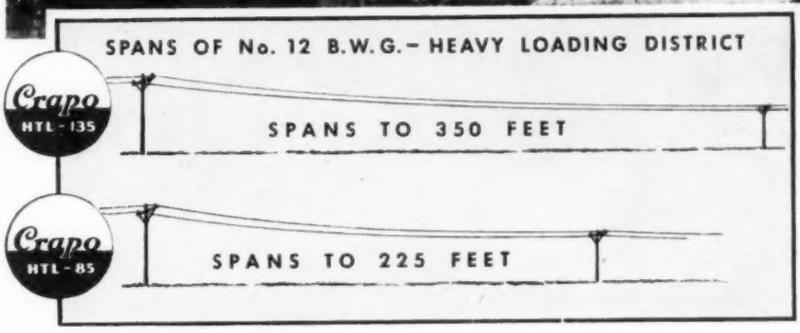
Besides wire and radio communications, the pigeons—the winged messengers of the Signal Corps—have played a valuable role in communications. The birds are taken across the enemy lines by patrols in pursuit of valuable information and have returned with news concerning the strength and location of enemy troops, gun positions, pending attacks, traffic conditions on congested roads and other vital data of activity behind the German lines. Pigeons have also been frequently the only means of communication by advanced observation posts located high in the mountains. They have been employed by armored patrols and during Ranger attacks with unbelievable success.

Many Feats of Heroism

MANY are the individual feats of heroism by Signal Corps officers and men. Among these, according to the report to the War Department, was that of Capt. Robert W. Trescott of Pawtucket, Rhode Island, who swam a 200-yard river under heavy fire to extricate

(Please turn to page 64)

Meet Post-War Demands With Longer Spans



LONG-SPAN construction, made practicable by *Crapo* High-Tensile Line Wire, will enable telephone companies everywhere to meet economically—and profitably—tomorrow's increased demands for rural service.

Longer spans mean fewer pole structures with a resultant initial saving in material and labor. Maintenance costs too, are minimized, for the superior strength of *Crapo* High-Tensile Line Wire reduces the possibility of service interruptions.

Crapo HTL-85 has 60% greater strength than standard B.B. wire; permits spans of 225 feet in heavy loading to 375 feet in light loading districts.

Crapo HTL-135 has two and one-half times the strength of B.B., makes possible extra long spans of 350 feet in heavy loading, 500 feet in light loading areas. Both *Crapo* HTL-85 and HTL-135 have telephonic transmission qualities, at voice frequency, superior to B.B. Wire.

Write for Technical Information!

Plan now to take full advantage of these economical, high-strength wires in your reconstruction program. Contact the nearest distributor of *Crapo* Galvanized Telephone Wire and Strand, or write direct for Bulletins No. 201 and No. 202!

INDIANA STEEL & WIRE COMPANY · MUNCIE, INDIANA

"For duty on the home front"

Deserving of the highest recognition are the thousands of girls in telephone Business Offices all over the country, for their work is an important part of telephone service in wartime.

The advertisement on the opposite page, appearing in national magazines during March, is a special citation for the girl in the Business Office, and for all telephone women carrying on the tradition of "The Voice with a Smile." It also asks the public's continued co-operation in the effective use of telephone service these days.

AN ADVERTISEMENT OF THE BELL TELEPHONE SYSTEM

SHE HAS THE VOICE WITH A SMILE, TOO

•

She's your personal representative at the telephone company—the girl in the Business Office

ANY TIME you'd like to know anything about service, or equipment, or bills, or wartime telephone regulations, she's there to help.

Sometimes, because of the war, she cannot give you the exact type of equipment or service you want—or just when you want it.

But you can be sure of this:

She will do her very best at all times and do it promptly, efficiently and courteously.

BELL TELEPHONE SYSTEM

When you are calling over war-busy Long Distance wires, the operator may ask you to "please limit your call to 5 minutes." That's to help more calls get through during rush periods.

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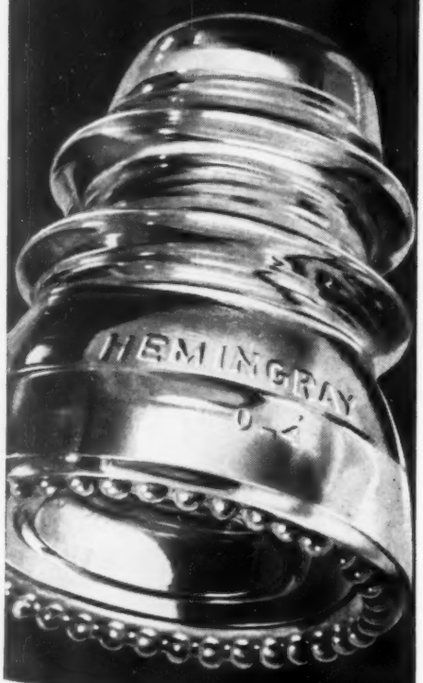
Favorably Known Since 1870



HEMINGRAY No. 42
Standard for many years. Its long leakage path keeps toll lines trouble-free.

Made by Experts for Experts

Hemingray Insulators are made as you would like to have them made. *Under exacting step-by-step quality production control!*

Every phase in the manufacturing process is checked and rechecked. And laboratory tests are made, all along the line.

In addition—Hemingray Insulators are made up and periodically tested under AIEE and ASTM standard specifications.

That's your assurance of *uniform quality and dependable, long-life service.*

Hemingrays are sold by principal jobbers and are manufactured by Owens-Illinois, Hemingray Division, Muncie, Ind.

OWENS-ILLINOIS
HEMINGRAY INSULATORS
Telephone-Telegraph

Export Agents: International Standard Electric Corporation, New York City

Report of Communications On the Italian Campaign

(Continued from page 61)

a cable which had become snagged in mid-stream. A division was dependent upon the cable and Capt. Trescott said, "It wasn't a question of what to do, or who should do it—being an impatient sort, I just decided we'd been held up long enough by that damned cable."

Master Sergeant James L. Kemp of Chico, California, crossed the Volturno River four successive times under fire in advance of the Infantry to lay wire cables for the latter regiment. Prior to the Volturno incident, he had been on duty for more than two days and nights without rest or relief. Sergeant Kemp, who is of gigantic proportions and sports a huge handlebar-type mustache, on another occasion near Mignano headed a party to lay a line by pack mule in an area with heavy fighting in progress and with only an aerial photo to guide him. As he and his men went up an almost vertical slope under shell fire, he would phone back at intervals about passing an infantry company's "front door" and seeing enemy patrols, while warning against any ringing back of the telephone because it would give away their position to the enemy. The unit of which Sergeant Kemp is a member has suffered more casualties than the reconnaissance troop of his batallion.

On the slopes of Mount Cessima, Lieutenants Irving S. Oliver of Louisville, Ky., and Ercil Miller of Napolean, Ohio, with a crew of eight men furnished wire communication for a Ranger unit during an attack. Under the heaviest sort of shell fire, one every fifteen seconds, for almost two days this unit worked with the Rangers in laying telephone lines. Sergeant J. K. Mason of Vernon, Texas, while laying Spiral-4 cable along the south bank of the Volturno was in a jeep which received a direct hit. Although suffering from shock and his wounds, he took time out to telephone his commanding officer from a field hospital to report the accident. Later it was found that the jeep, when hit, was proceeding through a heavily mined field and the wreckage of four other vehicles lay within a 100-yard radius of the jeep.

Prata Area, Italy. Linemen follow closely the improvised construction truck of a Signal Bn., typing Spiral-4 cable to the messenger for overhead suspension.

Pignataro Area, Italy. Pfc. Charles B. McKinney, Jr., Houston, Tex. with a Headquarters Company Infantry, operating an Italian switchboard picked up in combat.

Line Construction by Single Signal Corps Platoon

As an example of the tremendous tasks accomplished under combat conditions by a mere handful of men—one construction platoon of a Division Signal Company installed and rehabilitated a total of 900 miles of class "A" wire and 1032 miles of class "B" wire in 28 days, together with rehabilitating an additional 220 miles of open wire.

Corporal Leonard Mancuso of Cleveland, O., operating a reconniassance troop near San Marco and in charge of three radio jeeps providing communications to the rear met a stream of machine gun fire from concealed positions. All but Mancuso abandoned their vehicles and took shelter. "Damn it, this is no place for me", Mancuso yelled and, despite the narrow street, turned his jeep around and escaped. He was the only one of the party to get away and for maintaining a running account of the action by radio has been awarded the Silver Star.

Late Mail Delivery

is not unusual these days. Patience is asked by the Postoffice Department if mail is slow.

Bell System to Spend A Billion in Postwar Period

The huge Bell System which last year broke many of its records, plans to spend more than $1,000,000,000 for plant expansion in the postwar period, the annual report of American Telephone & Telegraph Co. disclosed Feb. 18.

To carry out the expansion, which will entail the greatest construction program ever undertaken by the system, additional capital will be needed, as well as materials and manpower, A. T. & T. President Walter S. Gifford declared.

The Bell System, comprising American Telephone & Telegraph and its principal telephone subsidiaries, in 1943 showed a consolidated net income of $177,769,000, or $9.50 a share applicable to A. T. & T. stock, compared with $164,319,746, or $8.79 a share in 1942.

A. T. & T. alone last year had a final net income of $168,530,764, or $9 a share —the amount necessary to cover the annual dividend in effect for some 22 years —compared with a preliminary net of $9.08 a share. In 1942 net income aggregated $163,033,894, or $8.72 a share.

Total assets of the Bell System continued to climb during 1943, amounting to $6,313,256,718 at the year-end, making the organization the world's largest, compared with $6,092,697,837 a year earlier.

In addition, the system last year also set records in gross revenues totaling $1,648,077,060, tax payments of $449,314,000, employees numbering 439,200, plant investment of $5,387,790,000 at the year-end, 150,000,000 long distance calls and 14,441,700 teletypewriter connections.

Mr. Gifford said the Bell System is considering the sale of its private line, Morse and teletypewriter exchange telegraph business, which accounts for some 2 per cent of the system's gross revenues, to Western Union Telegraph Co. However, he added that "any such sale" would first have to be approved by stockholders and by the Federal Communications Commission.

WLB Orders Checkoff

Upholding the right of a collective bargaining agreement to include the "maintenance of membership" clause and check-off of dues, the War Labor Board in mid-February ordered the Virginia Telephone & Telegraph Co. of Charlottesville, Va. and the International Brotherhood of Electrical Workers (AFL) to incorporate these clauses in a signed agreement. The Independent telephone company, which operates 22 exchanges in Virginia with over 15,000 stations, is controlled by the Central Electric and Telephone Co. of Sioux Falls, S. D.

In its order which supported a directive Oct. 15, 1943, of the Fourth Regional War Labor Board the National Board ordered that all employees as of March 4, 1944, who are in good standing and all who become members of the union after that date, "shall, as a condition of employment, maintain their membership for the duration of the collective bargaining agreement" or until a further order of the NWLB. The vote was 4 to 2 with both industry members dissenting.

The Board also ordered that the IBEW "must not intimidate or coerce" employees of the company into joining the union, and directed the IBEW to furnish to the War Labor Board and to the company a notarized

ROLL OF HONOR
EMPLOYEES OF THE
FORGED STEEL PRODUCTS COMPANY
SERVING WITH
The Armed Forces.
We Take Pride in Adding Another Name
MANY valiant men have gone forth from our ranks to join those other ranks of men who are risking their all in the cause of human liberty.
We inscribe their names on our Honor Roll with pride and a sense of awe.
Today, to their names we add another—the name of our product—fashioned by THEIR hands—eloquent testimonial to THEIR skill.
Although playing an humbler role, these silent mechanical servants of industry also are contributing to the great cause, on many fronts.
We inscribe the name "Vacuum Grip Pliers" on our Honor Roll, proud in the knowledge that meritorious performance has earned for them the right to be represented on fields where vital issues are at stake.
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Make KNOX knobs the finer quality products that have less failures and breakage. Just another of the better lines offered to you by Suttle.

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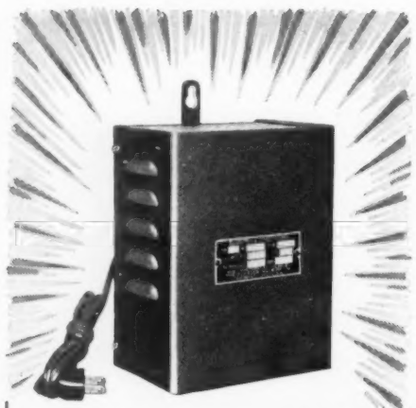
SUTTLE



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Operates direct from lighting circuit. Delivers constant, humless D.C. to operator's circuit on magneto switchboard. Power-off relay assures uninterrupted service in case of power failure. Low in cost! See your jobber, or write direct for full information.

SCHAUER MACHINE COMPANY
2059 READING RD., CINCINNATI 2, OHIO

Phone Job Aided Climb in Movies

list of members. The company was directed to deduct from the first pay each month the union dues of each member and to remit this sum to the union.

A former telephone operator who credits her gracious manner of speaking to her training at the switchboard is currently regarded as Columbia Pictures' "biggest investment."

In fact, Marguerite Chapman's studio called her its multi-million dollar gamble, because she was graduated from B films in a hurry and in rapid succession played leads in three major productions before any of them was released to the public.

Now her studio says it doesn't appear she was such a gamble after all. Success in the trio of films is paying off with stardom.

Miss Chapman likes to talk about her experience as an operator in her home town, White Plains, N. Y.

"I got a great kick out of achieving the voice with a smile," said Miss Chapman.

"I would listen to myself intoning, 'One moment please' and I still find myself using the phrase constantly. The telephone company was my voice teacher."

Miss Chapman has four brothers, all in the armed forces.

Bagdad! Sinbad's Calling the Caliph

A modern telephone network linking the ancient city of Bagdad in Asia with Tunis in Northwest Africa represents one of the toughest telephone construction jobs ever attempted.

It's a military network built by the Royal Corps of Signals, with lines stretching 3,765 miles and crossing the Western Sinai and Syrian deserts. Along the main route 120,000 poles were set in terrain ranging from solid rock to running sand, with 15,000 miles of wire weighing 1,500 tons and half a million insulators.

Known as the Middle East Telephone Network, the system includes three main exchanges and several smaller ones and more than a score of repeater, or amplifying stations along the route.

Most of the repeater stations are far removed from civilization. Each has its own power plant, water tanks and cooking facilities. The few men who run them live lives of monastic seclusion. Food and water must be carried as much as 100 miles to some of these lonely desert stations.

At the three main "trunk" exchanges—Tunis, Cairo and Bagdad—there are big, modern switchboards with the latest technical improvements. They were installed by the Royal Signals in especially constructed air-conditioned buildings and are staffed by girl operators.

C J. Larsen Dies

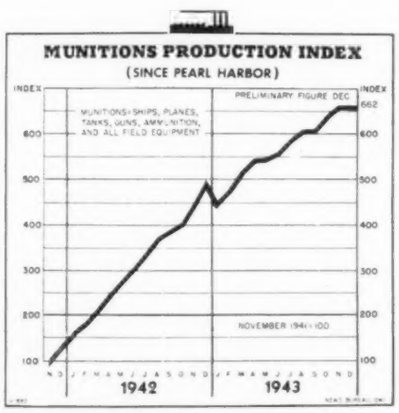
Christian J. Larsen, 67, for many years associated in engineering capacities with telephone operating companies in the Gary group, and most recently consulting engineer for Automatic Electric Co., died at his home in Chicago February 7. He had been under a doctor's care almost continuously since suffering a severe heart attack in 1939, however, he continued to carry on his engineering activities almost until the day of his death.

WPB Communications Division Moves To New Quarters

The Communications Division of the WPB has moved to new quarters in what is known as Temporary R Building. This building is located at Fourth Street and Jefferson Drive, S. W., across the street from the Social Security Building. Correspondence should still be addressed: "Communications Division, Office of War Utilities, War Production Board, Washington 25, D. C."

Phone Poles Sabotaged

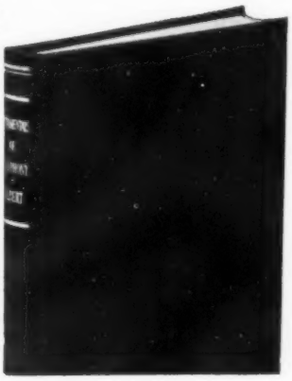
An Army unit on an Alaskan island outpost was prepared for trouble, but not the kind of trouble furnished by a pack of beavers. The men had finished setting a line of telephone poles around a large lake and the last wires were strung during the night. The next morning the soldiers discovered the beavers had gnawed through and toppled every pole. To prevent a recurrence the men, in replacing the poles, sheathed the base of each with metal strips cut from tin cans.



Presenting

A Simple, Up-to-the-minute Guide to Telephone Fundamentals

to give you the groundwork you need for best results in practical work



This first new telephone book in years provides the telephone worker with an understandable treatment of the technical aspects of his work, valuable as a key to better results and improved skill in any job he may undertake. The fundamentals of electricity and acoustics are covered, followed by a full elementary treatment of telephone equipment and circuits, their elements, characteristics, functions, etc.

Just Published

FUNDAMENTALS OF TELEPHONY

By ARTHUR LEMUEL ALBERT
Professor of Communication Engineering,
Oregon State College

374 pages, 5½ x 8½, 200 illustrations, $3.25

This book tells how and why telephone apparatus and lines operate as they do, covers the electrical theory and circuits with which every telephone worker should be familiar. It explains the phenomena of sound as they apply to telephony. It gives a practical knowledge of the functioning of transmitters, receivers, and other elements of telephone sets and systems, including modern manual and dial systems. It shows the requirements of local and toll transmission lines and how they are met, covering electrical measuring instruments, the measurements used in telephony, the problems of interference in telephone circuits, and other topics, in a clear, well-illustrated, elementary treatment, especially arranged for the non-engineering reader.

Check the data in these chapters

1. Direct-current Theory
2. Alternating-current Theory.
3. Electric Networks
4. Sound, Speech, and Hearing
5. Telephone Transmitters
6. Telephone Receivers
7. Telephone Sets
8. Manual Telephone Systems
9. Dial Telephone Systems
10. Transmission over Circuits with Distributed Constants
11. Transmission over Circuits with Lumped Constants
12. Measurements in Telephony.
13. Inductive Interference
14. Telephone Repeaters and Carrier Systems

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3. Available in 4 seat height ranges: 18 to 22"; 21 to 25"; 24 to 28" and 28 to 32".
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PARTY LINES

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with the
Improved RTC-2 VINCENT
RARE GAS RELAY
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Dual purpose device which economically improves both ringing and transmission on party lines.
NO MOVING PARTS.
Fully Guaranteed.
Can be installed in a minute

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Red Cross Provides Emergency Radiograms to Prisoners in Nazi Hands

The establishment of facilities for communications of "extreme emergency" between families and relatives of American soldiers in German prison camps has been consummated by the American Red Cross, Norman H. Davis, Red Cross Chairman announced Feb. 21. The Red Cross itself has been transmitting such messages, but now they can be sent by the families of prisoners.

The Red Cross announcement, as usual, cited that "cable facilities" were available, when actually only radiotelegraph service via Switzerland provides the means of communication. The radiograms are transmitted through the International Red Cross at Geneva. Similarly, for prisoners in the hands of the Japanese only radiograms can be transmitted.

While the idea of fixed text Prisoners' War Messages like the EFM plan has been under study, there is felt to be slim likelihood of completing such arrangements with the Germans or Japanese. The Christmas greetings, which were allowed from American families in 1942, did not prevail last Christmas, because of the limited communications facilities via Switzerland with the Axis nations and due to the increased number of American prisoners. To the Far East, families are allowed to send one personal radiogram to a prisoner or a civilian internee during the course of a year.

The "extreme emergency" radiograms to the prisoners in Germany will be such things as deaths of a member of the family or birth of a child and the sanction of such messages as emergency communications is left to the discretion of the National Red Cross.

Emergency communications, now sent by the Red Cross in behalf of prisoners, already average over 2,000 a month, according to reports from Red Cross chapters.

Alaskan Telephone Project Is Now in Operation

The Alaskan Highway Telephone Project—constructed under the direction of the Chief Signal Officer, Army Communications Service is now completed and in operation according to an announcement of the U. S. Army Signal Corps.

Ranked as the world's second longest carrier communications system, this 2,060-mile, two circuit telephone-teletypewriter line, expanded by "C" type carrier to provide 7 talking circuits and 14 teletypewriter circuits—together with four emergency radio stations of the portable type for standby communications in case of line failure—now link Helena, Montana, with Fairbanks, Alaska, extending over rugged and mountainous wilderness along the Alaskan Military Highway.

Telephone service as far as Whitehorse opened last May 24th. Work on the 663-mile stretch to Fairbanks was pushed from both ends to meet the October deadline, and long distance telephone conversations have been in progress from Fairbanks to Washington and elsewhere in the United States since mid-October.

Ready for Another Surrender Message

A 61-year-old Signal Corps sergeant, who as a telegraph operator received the telegram from Marshall Foch to General Pershing announcing the World War I Armistice, is now back in uniform at Fort Monmouth, N. J., and has asked for assignment to duty in the European Theatre of operations. "Who knows?" he asked. "If I get overseas I may be lucky enough to handle the message that announces Germany's surrender in this war."

He is First Sergeant Edward F. Martin, one of the oldest World War I veterans in the Army. He was with the AEF in France for 18 months and was cited for his services. Honorably discharged from the Army in 1919 he worked in Wall Street as a telegrapher until Pearl Harbor, when he enlisted in the Signal Corps as a private. Although he was an expert in Morse code, he was not familiar with the International or Radio codes, so he took the code course at the Fort Monmouth Enlisted Men's School.

Interlocking Directorates Approved

In an order Feb. 8 the FCC granted authority to J. R. Porter to hold interlocking positions as president and director of the Carolina Telephone and Telegraph Co. and its affiliate, the Home Telephone and Telegraph Co. of Virginia. Similar approval was granted to H. Cale Holderness to be director, secretary and treasurer of the two companies, and to L. W. Hill to hold positions as operating vice president and director of the two Independents.

Awarded Stars To Army-Navy "E"

The Emeryville, California plant of Hubbard and Company have been awarded the second star to add to their Army-Navy "E" pennant for continued achievement in war production. Wallace W. Glosser, vice president, is in charge of the Pacific coast division of Hubbard and Company.

The Pittsburgh main factory of Hubbard and Company have already been awarded its third star to their Army-Navy "E" pennant.

New Waterproof Instrument Bag Aids War Effort

A waterproof instrument bag, employed by American invasion forces in the present Italian and Southern Pacific campaigns to transfer delicate electrical equipment, medical supplies and food from ship to shore, has enabled Signal Corps and medical men to set up telephonic and radio communications and field hospitals upon landing thereby saving thousands of lives as a direct result of scouting information and medical aid.

This bag, developed for the Signal Corps by United States Rubber Company, is the first piece of standard equipment to be used which employs natural air as a buoyancy factor in the transfer of heavy equipment in water.

Dryness, which is of paramount importance insofar as electrical equipment is concerned, is definitely assured by the use of this development. Switchboards, field radios, head sets, microphones, generators, remote control units, cameras, wire, cable, medical supplies and food are transferred in them.

Ray-O-Vac Wins Patent Suit

The Ray-O-Vac Company's exclusive right to manufacture Leakproof batteries was upheld by the United States Supreme Court in a recent decision handed down in Washington.

The Leakproof principle calls for the sealing of the dry batteries in a metal sleeve. The special encasement guards against evaporation of the moisture within the cell, and greatly extends its period of "freshness." At the same time it prevents the leakage of chemicals and protects the flashlight or radio against corrosion and rust.

Buys Arkansas Exchange

O. C. Lock has purchased the Bradford (Ark.) Telephone system from Mrs. Luella Hendrickson for the reported sum of $4,000. Authorization was made February 3 by the Arkansas department of Public Utilities.

...because he used Amertel

This typical American expression of finality describes exactly how telephone men feel when they string Amertel wire. They know that sound engineering and lasting construction calls for the very qualities offered by Amertel galvanized iron or steel wire.

This is true regardless of weather and local conditions for there's an Amertel wire for the longest span or the shortest span . . . for the heavy loading zone and the light loading zone.

And, right now this extra strength and quality that's in every inch of every type of Amertel is more important than ever. It helps do away with repairs, replacements and service calls. The job is done—"once and for all"—when you use Amertel.

USS Amertel TELEPHONE AND TELEGRAPH WIRE AMERICAN STEEL & WIRE COMPANY

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(NORTHERN WHITE CEDAR)

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TREATED full length

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- 1. Brings heartwood durability to the surface making sapwood durability equal to the heartwood.
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- 4. Prevents corrosive action on hardware.
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NAUGLE POLE and TIE CORP.

Western & Northern Cedar Poles

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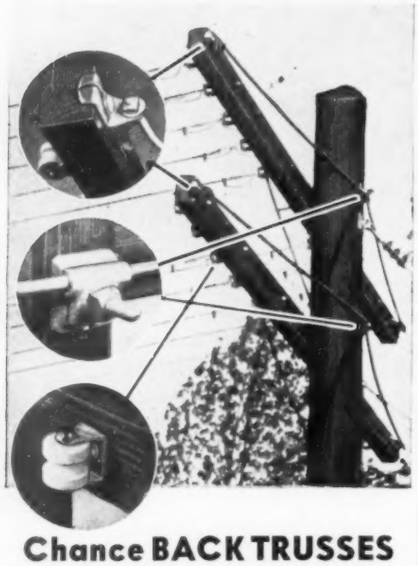

Chance BACK TRUSSES relieve cross arm strain Chance back trusses and terminal brackets put the dead-end load where it belongs and add years to the life of cross arms. Lines dead-ended on pins exert a heavy twisting strain on the arm and in a surprisingly short time the arm has to be replaced. With the Chance back truss method lines are dead-ended on terminal brackets mounted on the face of the arm. The load is evenly distributed and pulls directly against the steel truss. Most of the installation job can be done on the ground.

Once you have used this method you will use nothing else. Write for complete details.

INSULATORS

A·B·CHANCE CO. CENTRALIA MISSOURI

Named Vice President of International Standard

E. S. McLarn

E. S. McLarn, who has been with the International Standard Electric Corp. and its predecessors for 40 years, Feb. 16 was elected a vice-president of that corporation. The I.S.E. is the major worldwide manufacturing subsidiary of the International Telephone and Telegraph Corp.

Mr. McLarn, at present assistant technical director of I.S.E., has been associated with the development of the 18-gauge parallel copper-weld drop wire, the 22-gauge plastic inside telephone wire, and the design and development of a convertible telephone and a subscriber's set telephone set of unique design which the Signal Corps recently designated as standard for tropical use. He also pioneered in the creation of a sectional switchboard, a flexible type that can be expanded for traffic increases.

Stromberg-Carlson Breaks All Production Records

The greatest month's production ever turned out by the company in its fifty years at operations has been achieved by the Stromberg-Carlson Company of Rochester, N. Y., it was announced today by Dr. Ray H. Manson, vice president and general manager of the company. The company is turning out radio, radar, and communications equipment for the armed forces on the land, the sea and in the air.

The record was achieved in the month of February, and represents a production rate even more remarkable in the light of the shortness of the month, according to Dr. Manson. Production in February exceeded the production of the entire year of 1940.

He revealed that 98% of the entire month's production represents material shipped to the armed forces.

McCabe Powers Company Awarded Army-Navy "E"

For high achievement in the production of vitally needed war materiel, the McCabe Powers Auto Body Co., St. Louis, Mo., was recently presented with the Army-Navy "E".

The pennant, presented by Col. Malcolm Elliott, division army engineer for the Upper Mississippi Valley, was accepted by Edward J. Powers, Jr. and John J. Powers, vice presidents of the company.

In peace times, McCabe Powers manufactures auto, truck, ambulance, coach and trailer bodies for Public Utility, Municipal, Dairy, Meat Packing, Quarry, and Motor Freight use. Now, however, among the more than fifty items being manufactured by the firm for war use are collapsible mobile machine shops, bodies for high explosives, map reproduction trains consisting of printing press and map layout trucks, camera and dark room trailers as well as mobile refrigeration units and balloon barrage trailers.

Western Electric Opens Wisconsin Plant

The Western Electric Company has leased Area 2 of the Eau Claire Ordnance plant at Eau Claire, Wis. formerly engaged in arms production.

Western Electric Company's war production responsibilities have grown beyond present manufacturing facilities, which include three main plants at Chicago, Ill., Kearny, N. J., and Baltimore, Md., and numerous distributing house shops located throughout the country. It was necessary for them to obtain manufacturing quarters promptly because of the urgent need for additional production and inasmuch as the size of quarters required and other necessary facilities were readily available at the Eau Claire Ordnance Plant, the decision was reached to augment the capacity of its Hawthorne Works in Chicago by establishing the Eau Claire branch.

Although the plant, which is located midway between Eau Claire and Chippewa Falls, is well suited for the type of work Western Electric will perform, some changes will have to be made to conform to their processes. As soon as these have been completed, the Company expects to begin operations. Capacity manufacture will follow as rapidly as equipment can be obtained and personnel trained.

Press Association Photo

Telephone helps take Tarawa

In the lower left corner of this great action shot of Marines on Tarawa, you'll find an old friend — the telephone. In the thick of it wherever our fighters go, this familiar instrument is helping to win and hold objective after objective on the road to final Victory.

Until that great day comes, Western Electric's thousands of skilled men and women will continue to speed the flow of field telephones, switchboards, wire and cable that literally form the life lines of men in combat.

To speed Victory, buy all the War Bonds you can!

75TH ANNIVERSARY

Western Electric

IN PEACE...SOURCE OF SUPPLY FOR THE BELL SYSTEM.
IN WAR...ARSENAL OF COMMUNICATIONS EQUIPMENT.

ARMY E NAVY

FIGHTING TODAY-
READY FOR TOMORROW!

Phillips products today are fighting on every front — in tanks, planes and ships — in combat communication networks — in telephone exchanges and war factories in the battle of production at home.

Wherever Phillips products are used, Phillips dependability proves itself equal to the test. Careful supervision and control of every step in manufacture, from raw material to finished goods, insures rugged quality which stands up unflinchingly to the severest demands of wartime service.

This stamina will be equally welcome when peacetime needs can again be met and when Phillips wires, cables, cords, relays and other products will again be available throughout the world — through the globe-circling distribution of International Automatic Electric Corporation and its subsidiaries.

TELEPHONE WIRE AND CABLE
TELEGRAPH WIRE
MAGNET, AUTOMOTIVE, AIRCRAFT AND BUILDING WIRE
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Telephone Engineer
HANDBOOK TABLES

Index—Pole Line Design
Date—March 15, 1944

Formulae Used in Computing Pole Strength

Pole strength computations are made for the purpose of determining the size of poles required to carry a given load within the limits of safety required for the class of pole line to be constructed. Too large a pole size results in unnecessarily high capital charges; on the other hand, if the poles are too small, service interruptions and high maintenance cost result from failures under storm conditions.

1. Movement of Resistance Due to Wind Pressure on Wires

$$M_w = P\ L\ D\ N\ S$$

Where M_w = Moment of resistance in foot-pounds due to wire load.
P = Wind pressure on wire and ice coating for storm loading district (pounds per square feet).
L = Height in feet from ground line to approximate center of wire load supported by pole.
D = Total diameter of wire and ice coating in feet $= \frac{2 \times \text{radial thickness of ice} + \text{wire diameter}}{12}$
N = Number of equivalent 104 wires.
S = Average length of wire span in feet.

2. Moment of Resistance Due to Wind Pressure on Pole

$$M_p = \frac{PH^2\ (2C_t + C_g)}{226.2}$$

Where M_p = Moment of resistance of pole due to wind pressure, expressed in foot pounds.
P = Wind pressure on pole in pounds per square feet for storm loading district.
H = Height of pole in feet from ground line to top.
C_t = Circumference in inches of pole top.
C_g = Circumference in inches of poles at ground line.
Note: C_t and C_g are assumed values obtained from a pole classification table for the type of pole to be used. These values are revised if they are too high or too low for the design safety factor of the pole line under consideration.

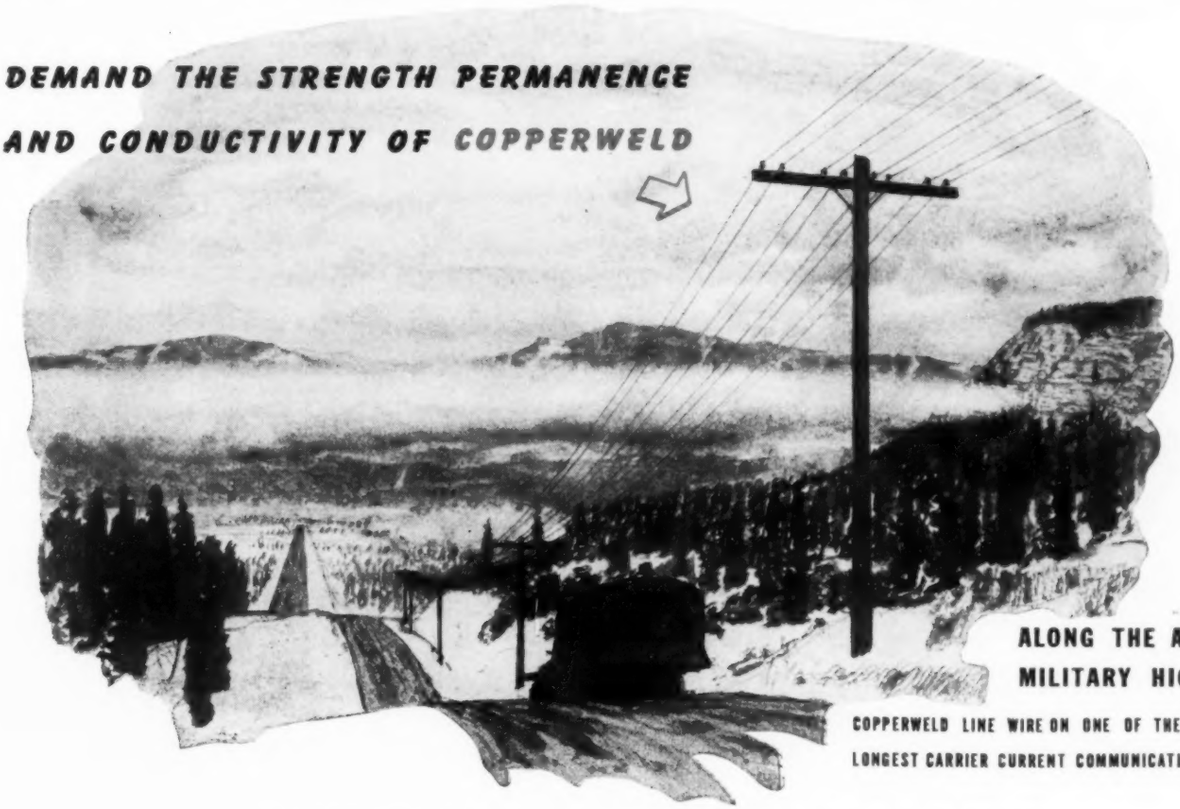
3. Total Moment of Resistance for Pole Line Under Design

$$M_T = (M_w + M_p)\ F_s$$

M_T = Total moment of resistance in foot pounds
F_s = Factor of safety for class of pole line under consideration.
The pole class corresponding to the computed moment of resistance may be found by reference to a table of moments of resistance for poles.

Vast Distances and Arctic Weather-

DEMAND THE STRENGTH PERMANENCE AND CONDUCTIVITY OF COPPERWELD



ALONG THE ALASKA MILITARY HIGHWAY

COPPERWELD LINE WIRE ON ONE OF THE WORLD'S LONGEST CARRIER CURRENT COMMUNICATION LINES.

The 4,000 miles of Copperweld carrier circuits built and operated by the Army's Signal Corps along the Alaska Military Highway is in the toughest weather belt on the continent. Blizzards, ice, sub-zero temperatures, high winds, falling trees—all have a crack at this line. The steel core of the Copperweld wire chosen for this job provides the strength and stamina to stand up against these conditions. The thick copper exterior provides permanence and conductance. The Army gets the message through on Copperweld.

For your communication jobs plan to get what only Copperweld can give you—the strength and stability of steel with the conductivity and permanence of copper. Our representatives throughout the country are at your service. Call upon them for assistance and information.

Copperweld Steel Company · GLASSPORT, PA.

Copperweld TELEPHONE LINE WIRE

STRENGTH PERMANENCE CONDUCTIVITY

FOR VOICE AND CARRIER CIRCUITS ON OPEN WIRE CONSTRUCTION

Development of Coiled Cords Results In Formation of Cordage, Incorporated

Type of coiled cords to be manufactured by Cordage, Inc.

The recent formation of Cordage, Incorporated marks a forward step in the development of the features that have made the Kellogg Koiled Kord the enthusiastic choice of thousands of Independent telephone men and, currently, many branches of our Armed Services.

Officers of the new organization are C. D. Manning, president, R. D. Collins and H. D. Hurlbut, vice-presidents and E. Johnson, secretary-treasurer. Directors include, in addition to Mr. Manning and Mr. Collins, J. H. Kellogg, H. C. McCluskey, and C. F. Mason. P. C. Geraty, for many years head of the Insulating Department of the Kellogg Switchboard and Supply Company, Chicago, has been appointed manager of Cordage, Incorporated.

Devoted primarily to the manufacture of rubber-jacketed and retractable electrical cords, Cordage, Incorporated is an outgrowth of the research and development conducted by R. D. Collins of Santa Monica, California during the past several years: Mr. Collins, who is commercial superintendent of the Associated Telephone Co., Ltd. in Santa Monica, originated the process responsible for the ever increasing popularity of the Kellogg retractable handset telephone cord. This process, which principally involves spirally molding the rubber jacket, assures retention of the cord's normal position. As a consequence maximum retractability is acquired without the use of wire springs or similar, separate mechanical devices. Recently, both Neoprene and Buna-S have been used in place of rubber for the outside covering of Kellogg Koiled Cords with satisfactory results.

When first introduced, the Kellogg Company was quick to recognize the possibilities of this new process and became exclusive distributors, to the Independent telephone industry, of handset telephone cords incorporating its features. Under the new organizational setup, all orders for products of Cordage, Incorporated will be handled through the Kellogg Company.

A major percentage of the new organization's output is, at present, being absorbed by the U. S. Army Air Forces and Signal Corps. In addition to retractable telephone instrument cords, retractable electrical cords are designed for greater current-carrying capacities and in a variety of lengths.

Because these cords can be stretched to approximately seven times their original length, their possible applications by manufacturers of electrical equipment and appliances are unlimited. Whether used on washing machines or floor lamps, soldering tools or toasters, in fact any tool or appliance requiring an electrical cord, their retractable feature is certain to win the enthusiastic approval of buyers and users of such equipment.

Greenlee Tool Company Selects Telephone Engineer & Management

The Greenlee Tool Company, Rockford, Ill. has launched a new advertising and merchandising program according to an announcement made by R. J. Samuelson, sales-manager and R. E. Brightup, advertising manager, key men on a planning committee responsible for directing new activities. TELEPHONE ENGINEER & MANAGEMENT was chosen to carry their advertising message to the telephone industry.

Recognizing that it may not be long before their distributors and dealers will again have a real merchandising job to do, the new stepped-up advertising campaign is aimed at putting greater promotion than ever before behind the Greenlee name which has been established as a high quality line in the tool business for over sixty years. The opening advertisement to the telephone industry was carried in the February issue of TELEPHONE ENGINEER & MANAGEMENT. Tools for pipe pushing and pipe bending will be of interest to our industry. Howard H. Monk and Associates of Rockford, Illinois is the advertising agency handling the campaign.

New Recessed-Lamp

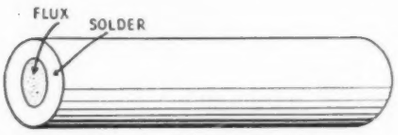
The H. R. Kirkland Company of Morristown, N. J., announce a new and interesting Pilot Light for either panel or switchplate mounting. It is called the S11 Unit and being produced at the plant of the Kirkland concern.

The S11 Unit is for use with the standard S11 lamp bulb, 10 watt, available in all colors. The bulb is so recessed into the unit from the front of the panel that the tip of the lens exposed assumes the appearance of a lens.

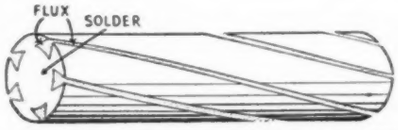
For use on panels, (single-hole mounting); can be mounted on a single-gang switchplate to become a desirable Marker-Light; Exit-Light; Over-door Light, etc.

The American Red Cross maintains a staff of trained workers to aid service men's families in trouble. This and other services to members of our armed forces and their families can be continued only with your help. Give to the 1944 Red Cross War Fund.

New Solder Announced



CONVENTIONAL FLUX-CORE WIRE SOLDER



NEW TYPE OF WIRE SOLDER WITH FLUX IN GROOVES

A new type of fluxed wire solder, which contains flux in longitudinal grooves on the surface rather than in the conventional core, has just been placed on the market. According to the manufacturer, the product represents the first basic improvement in fluxed wire solder design since the introduction of this type of material a number of years ago.

The new material, called Fluxrite and put out by National Lead Company, 111 Broadway, New York, is said to overcome completely an inherent disadvantage of regular cored solders which supply flux and solder to the surface simultaneously. Since the flux in the new product is outside rather than inside, it liquefies and flows onto the work before the solder melts. This insures thorough and complete fluxing and results in stronger and better solder joins. Mention TELEPHONE ENGINEER when writing for further details.

American Coach and Body Issues Descriptive Literature

An attractive folder illustrating their complete line of utility company trucks has been issued by the American Coach and Body Company, 9503 Woodland Ave., Cleveland 4, Ohio. The folder gives the company's idea of the situation of utility trucks and bodies in regard to the present and post war situation. President James Holan of the company, after analyzing data secured by personal contacts with utility executives during the past six months, reviews what might be expected after "V" day. A new purchase plan called the "American Coach Replacement Plan" is also explained outlining how telephone companies can now plan for replacements to bring fleets up to pre-war effectiveness. Copies may be obtained by writing the company and mentioning TELEPHONE ENGINEER & MANAGEMENT.

Philco Wins Another Army-Navy "E"

In recognition of continued excellence in its war production record, the Storage Battery Division of Philco Corporation at Trenton, N. J., has just received its fourth Army-Navy "E" Award, it was announced today by M. W. Heinritz, vice president in charge of the Division, who was notified of the honor by Admiral C. C. Bloch, chairman of the Navy Board for Production Awards.

With all its production going directly, or indirectly, to the war effort, the Philco Storage Battery Division is furnishing large quantities of batteries for the operation of the Water Buffalo type landing craft and PT boats, for use aboard the new Liberty ships for inter-communication and gun-firing, and for the 2,000 mile telephone line from Edmonton, Alberta to Fairbanks, Alaska on the Alcan highway, as well as for essential telephone, electric power, railroad, mining, and industrial uses.

To date Philco Corporation has received thirteen "E" Awards for its outstanding war production record, and the Company's operations are at the highest level in its history.

SUB-CYCLE

PRODUCES A POWERFUL RINGING CURRENT

Entirely Independent Of Frequency Variations in the Commercial Power Supply

It embodies ALL the desirable characteristics for the Ideal Ringing Converter and has proved its superiority and efficiency under the most severe operating conditions. When you install Sub-Cycle you are assured that it will need no routine maintenance—there will be nothing to adjust—there are no moving parts—operation is quiet and economical. In fact, you just can't beat it for safeguarding your signaling service.

●

ALSO PULSATORS

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Sold by Leading Distributors

THE LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

ACORN LONG LIFE DROP WIRE SPANS TODAY'S SHORTAGE

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INSULATED WIRE

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Write or call at our expense.

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3rd Fl. N. Y. Life Bldg., 20 West Ninth St. Kansas City, Mo.
Citizens Trust Bldg., Fort Wayne, Ind.
135 So. Second Street, Philadelphia, Pa.

Reconstructed Equipment

Kellogg or Western Elec. New Composition Rec. Shells and caps @	$ .45
Kellogg, W. E., Stromberg, Monarch, Am. Elec. or Dean New Composition Mouthpieces @	.08
Switchboard Cord weights @	.20
Kellogg No. 51 Common Battery Ind. Coils 40c—79 @	.50
48 Volt Switchboard lamps per 100 @	5.00
Stromberg Carlson No. 114 Double Cut off Jacks 10 per strip @	2.50
Stromberg No. 121 Lamp jacks with Lamps & Lamp caps 10 per strip @	3.00
Stromberg Carlson 2 Cond. Swbd. Plug fits No. 11 drop and jack practically New @	.40
Stromberg Carlson No. 53X 3 Cond. Swbd. Plugs Practically New @	.55
Auto Elec. Co. All Bakelite enclosed Gong Signal sets with Straight line ringer and Cond. Less Ind. Coil @	3.25
Western Elec. No. 323 Transmitters with Mouthpiece less back @	1.15
Reliable Elec. No. 7A or 7T Fiber Fuses @	.05
Local Battery Granulated Transmitter carbon Per Oz. @	1.75
Western Elec. No. 21 2 M. F. Condensers @	.35
Kellogg No. 103 1 M. F. Condensers @	.40
L. M. Ericsson Watch Case Receivers less band and Cord @	.70

REBUILT ELECTRIC EQUIPMENT CO.
1704 West 21st Place
Pilsen Station, Chicago

AN ANSWER!

Greenland	827,300	square miles
New Guinea	542,600	" "
Borneo	385,200	" "
Madagascar	228,500	" "

ARE YOU AN INDEPENDENT TELEPHONE PIONEER?

Apply today to J. K. Johnston, secretary, Lemcke Building—Indianapolis, Indiana.

Classified Ads

WANTED: Assistant Chief operator for Automatic board by telephone company in northern Ohio. Not over 35 years. Steady position, nice location, good working quarters, opportunity to advance, good salary. Reply to Box 8325, c/o TELEPHONE ENGINEER.

WANTED: Telephone Accountant—qualified to supervise all phases of telephone accounting for Class A companies. Give full information as to age, experience, draft status, etc. Attach small photograph. Telephone Services Inc., 16th Floor Lincoln Tower, Fort Wayne, Indiana.

WANTED—WIRE CHIEF for group of five exchanges. Must have thorough knowledge of North all-relay equipment, common battery switchboard maintenance and general cable work. Excellent permanent position for man with all around telephone experience and a worker. Salary starts at $2700 a year, raise to $3000 when ability proven. Address Box 8324, c/o TELEPHONE ENGINEER.

WANTED—Assistant Manager for growing telephone manufacturing company in Chicago. Good salary. Permanent position with excellent future. Must have some knowledge of office routine and bookkeeping. Experience in telephone business helpful but not essential. All correspondence confidential. Reply to Box 8325, c/o TELEPHONE ENGINEER.

SPLICER'S TOOLS Of Top Quality by UNIQUE

- FURNACES
- SOLDER POTS
- BLOW TORCHES
- WIPING CLOTHS
- BALANCED LADLES
- SOLDER IRON HANDLES
- THAWING TORCHES
- FOLDING SAFETY SHIELDS

Protect Public, Splicer, and Furnace. No. 50 C Shield shown here. Of 22 Ga. galvanized steel. Reinforced edges. 23"x17" x17". No. 50—four-sided with grate. No. 50 A—same without grate.

Your Jobber Has These Tools
UNIQUE MANUFACTURING CO., INC.
221 W. Walton St. — Chicago 10, Ill.

NEW RETARD COILS KELLOGG NO. 56

ALSO RECONDITIONED KELLOGG 8-9-10 14-16-18-21-22 25-40-42

BUCKEYE TELEPHONE & SUPPLY COMPANY
COLUMBUS 16, OHIO

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Write or Telephone for Proposition

TELEPHONE L.D. 16
TELEPHONE BLDG., DAYTON, OHIO

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JAY G. MITCHELL
Consulting Engineer
Operating and Management Economics
Plant—Equipment—Revenue
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EATONTOWN, NEW JERSEY

J. W. WOPAT
CONSULTING ENGINEER
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J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
105 West Adams Street
CHICAGO

Classified Ads

POSITION WANTED: Thoroughly experienced and capable telephone man desires permanent connection. Qualified for assignment as plant engineer, plant supervisor or district manager. Just over draft age limit. Presently employed. Can furnish good references. Box 8320, c/o Telephone Engineer.

WANTED: GENERAL MANAGER qualified to operate telephone company in mid-west state having over 12,000 stations. Must have administrative ability and experience in plant construction and maintenance as well as accounting, commercial and traffic operations. Permanent position with excellent salary to qualified man. Give complete information in first reply stating previous experience, draft status, recommendations, etc. Write Box 8321, c/o TELEPHONE ENGINEER.

WANTED: General Manager for large telephone property. Must have executive ability and administrative experience. Good salary for man having qualifications. In replying, furnish complete information as to age, education, experience, present employment, draft status, small photograph, recommendations, etc. Write to: Telephone Services Inc., Lincoln Tower, Ft. Wayne 2, Indiana.

Telephone Repair Co.

Repair services for Transmitters, Receivers, Desk Stands and Wall Phones—Magneto or Common Battery.

Specialists in Repairing and Rebuilding Transmitters

WE TRADE
WE BUY
WE REBUILD

Old telephones or parts into smart modern-looking wall phones or desk sets with new cabinets.

Telephone Repair Co.
Daniel H. McNulty, Manager
Rogers Park Station Chicago

Poles

Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.

POSITION WANTED: I am seeking a position with a reliable telephone company and offer the experience listed for your consideration. I have 17 years experience as plant superintendent, district wire chief, manager and wire chief. Am 36 years old, married and my draft status is 3-A. Can furnish statement of availability and letters of reference to cover the above experience. Prefer Mid-West or North East. Write Box 8322, c/o TELEPHONE ENGINEER.

With the formed wiping cloth and a little practice the average joint wiper will turn out hand wiped joints as uniform and as smoothly finished as though they were turned on a machine lathe, or cast in a mould.

"Williams" WIPING CLOTHS
GEO. E. WILLIAMS, Mfr.
3035 Aldrich Avenue Minneapolis, Minn.

AVAILABLE JULY 15—Qualified telephone engineer, 28 years experience in all phases of telephone work, desires connection as a supervising executive or manager of a telephone company or group within the United States. Well grounded in all systems. Write to Box 8323, c/o TELEPHONE ENGINEER.

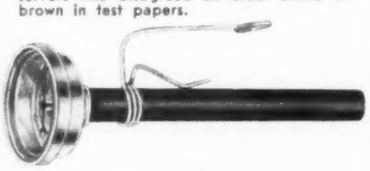
WANTED—Man to repair and rewire Magneto Telephones. For Factory in Chicago. Write Box 8306, c/o TELEPHONE ENGINEER.

PROOF!

ACTUAL LABORATORY TESTS SHOW THAT THE "PAPER" METHOD OF OBTAINING METAL TEMPERATURE GIVES HIGHLY VARIABLE RESULTS

LAB-REPORT

"In the test, pieces of paper were inserted in molten solder. Simulating actual field conditions, the thickness and characteristics of the papers varied. Some were newspaper, some wrapping paper, still others light cardboard. These all turned brown at different temperatures. Error was further increased by unbiased observers who disagreed on exact shade of brown in test papers.



EXACT TEMPERATURE

Dillon Temperometer *always* reads the same. No chance for error. Instantaneous. Handy. Priced low to make the job right!

$6 each.

W.C. DILLON & CO. INC. 5410 W HARRISON STREET CHICAGO ILLINOIS

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For Permanent Identification

When the stenciled markings on poles and other equipment have weathered away, look into Premax Stamped and Embossed Metal Letters, Figures and Pole Markers.

They'll do the job at less than stenciling cost . . . and last as long as the pole.

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...ENGINEERED SPECIFICALLY FOR MODERN FULL FLOAT SERVICE!

IN a battery on full float service, maximum service life combined with high electrical efficiency requires special design . . . special construction . . . special grid metal. Philco Floté is the *only* battery specifically engineered to do this job!

Philco Floté grid design not only retards peroxidation by exposing a minimum of metal on the surface of the plate, but also provides exceptional strength and superior electrical efficiency. Philco Floté grid metal reduces by as much as 40% the amount of current necessary to maintain the charge!

Write direct or call your local telephone jobber for complete information and specifications on Philco Floté Batteries for full float telephone service.

Philco Corporation
Storage Battery Division
Trenton 7
New Jersey

Specify

PHILCO

TELEPHONE BATTERIES

NORTH CX-200

DIAL AUTOMATIC CENTRAL OFFICE

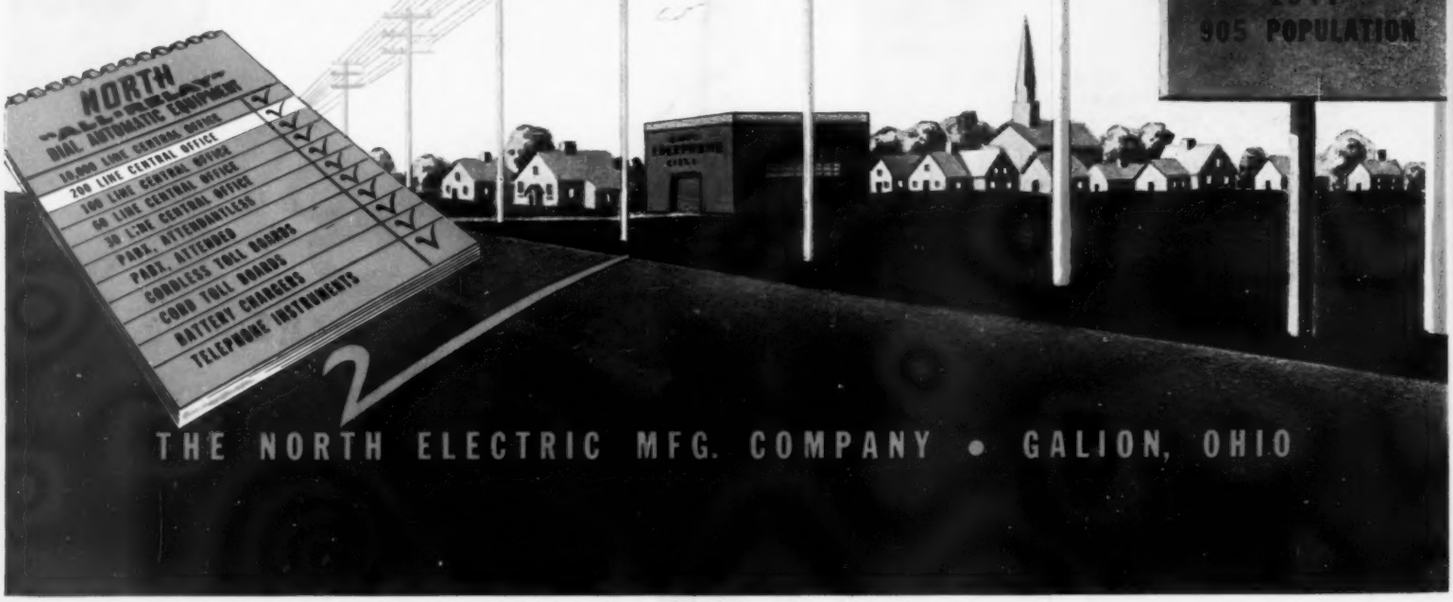
One of the most attractive fields for "proving in" dial automatic is in the exchange requiring 100 to 200 lines of equipment.

If the office to be converted is located in a community of stabilized population, the NORTH "ALL-RELAY" CX-200 type switchboard is the logical choice.

The maintenance-free performance of NORTH "ALL-RELAY" equipment, plus the economies effected by the change-over, make it a sound and profitable investment throughout its unusually long life.

Furnished initially equipped with 50 to 200 lines.

No routine maintenance.



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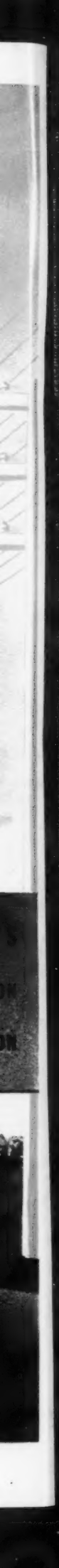

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